Employment, uncertainty and fertility in couples: modelling longitudinal clustered data

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Employment, Uncertainty and Fertility in Couples: Modelling Longitudinal Clustered Data

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Abstract

In recent decades, total fertility has declined in almost all European countries and has reached sub-replacement levels. From the 1990s, and in particular in the aftermath of the Great Recession, economic uncertainty escalated as a fundamental factor in explaining the postponement of family formation and the fertility decline in Europe. The primary goal of this PhD dissertation is to investigate the link between economic uncertainty (using employment uncertainty as proxy), and the transition to the first and to the second child across European countries. An ancillary goal of this research is to scrutinize the effects of the Great Recession on fertility. We use the longitudinal section of EU-SILC (European Statistics on Income and Living Condition), across the years 2004-2015. The survey offers information about individuals and households by collecting a wealth of socio-economic and demographic characteristics. Given that couples are followed for several years and they are nested into countries, we adopt a multilevel discrete-time hazard model of birth conceptions with a random intercept and a random slope on calendar time. For these models, country-specific patterns are obtained via Empirical Bayes predictions. Moreover, according to several goodness-of-fit indicators, the models have a satisfactory fit. To analyse the effect of the Great Recession on fertility we rely on a structural break approach. Our results suggest, in general, that for both partners alternative job typologies than permanent employment depress fertility, especially for women; so, permanent occupations are associated with higher fertility. Furthermore, from the comparison between baseline couple with those in which one of the partners is not active emerges that, for Nordic countries alternative job typologies than permanent employment of either partners leads to a decrease in the hazard of the conception of the first child, especially if the man is not active. Conversely, in Southern countries, if the woman is not active it emerges a positive association with the hazard of the conception of the first child; while if the man is not active the association remains negative. Instead, in the case of the conception of the second child emerges that in Northern and Western countries the couple where the woman is not active presents an increase in the hazard of the conception of the second child, while in Western countries if the man is not active the hazard decrease. Finally, the structural break analysis suggest that the Great Recession had a relevant negative impact on conception of first and the second child in almost all the European countries.

Introduction

In recent decades, total fertility has declined in almost all European countries and has reached sub-replacement levels. The decreasing trend that characterizes TFR (Total Fertility Rate) is not equal across Europe: for Northern countries it is observed a decline from 2 children per woman in 1990 to 1.7 in 2017 (Eurostat 1990-2017); this value is experiencing a similar, but smaller in magnitude, contraction with an average value of around 1.4 in 2017 in Southern countries. Previously, the decline in fertility was associated with the parallel increase in women's labour force participation, even if since mid-1980s this association has become positive (Brewester and Rindfuss 2000; Ahn and Mira 2002; Engelhardt, Kogel and Prskawetz 2004). Instead, starting from the 1990s economic uncertainty is introduced as a fundamental factor in explaining the decline in fertility and in the postponement of family formation across European countries (Kreyenfeld, Andersson and Pailhé 2012). Due to the increased uncertainty, it becomes more difficult for people to compare and rank the various option for educational, professional or partnership careers, simply because they know too less about future alternatives (Kohler, Billari and Ortega 2002; Vignoli et al. 2020a, b)

The economic uncertainty is a multi-faceted concept, which can have both a macro and micro connotation. It can be viewed as an individual risk factor, mainly related to the labour market uncertainty (e.g. unemployed, part-time work, term-limited contract, and so forth) (Mills and Blossfeld 2013; Blossfeld and Hofmeister 2006). Life-course circumstances characterized by precarious employment spells translate into a feeling of economic uncertainty for individuals because these jobs often bring with them economic penalties and uncertain futures (Scherer 2009; Standing 2011). After all, in previous literature, unemployment and job (in)stability are often use as proxy of economic uncertainty (Blossfeld et al. 2005; Kohler and Kohler 2002; Vignoli, Drefahl and De Santis 2012). Economic uncertainty can also be defined as a macro-level phenomenon, linked to the general uncertainty perceived by individuals in times of economic crisis (Sobotka, Skirbekk, Philipov 2011). Moreover, macro-level economic downturns can translate into micro-level perceptions of economic uncertainty, regardless of the real situation of people.

In general, job uncertainty concerns what happens in the labour market in terms of availability of stable jobs or in any sort of work that can allow to cope with family expenses (Scherer 2009; Bloom 2014; Moore 2016). Individuals who are in a situation of uncertainty usually avoid long-term commitments; this involves a delay in leaving the parental home to start their own family and a postponement of childbearing (Billari 2005). Regarding the choice to have another child, the labour force decision made at the time or surrounding first birth, may condition subsequent births decisions (Adam 1996). Mothers with temporary job contracts could decide not to have another child because

this could interfere their chance of obtaining a more stable employment. Hence, women with fixed-term contracts will have low level of fertility (Baizán 2005). In general, economic uncertainty, and especially employment uncertainty, appears as an important determinant of the decision to have the first or another child for both men and women.

Not much is known yet about the influence that economic uncertainty has on fertility, although studies regarding this link have increased rapidly in recent years. So, the goal of this doctoral thesis is to investigate the link between economic uncertainty (using employment uncertainty as proxy), and the transition to the first and to the second child across European countries, to provide new information on the impact that economic uncertainty has on fertility. To analyse this nexus, we acknowledge that family behaviours are interconnected between individuals and over time. In general, in previous studies, only the activity status of women is analysed, and also in the research that evaluate the potentially gendered nature of the relation between employment and fertility often consider women's and men's family and work histories separately. Therefore, the innovative aspect of this research is to use a couple approach, that is the working status of both partners are evaluated jointly in the same model. Furthermore, using longitudinal data referring to different European countries (EU-SILC dataset) it is possible to study how the relationship between economic uncertainty and fertility varies in the different available countries.

An ancillary goal of this thesis is to scrutinize the effects of the Great Recession on fertility in Europe (Sobotka, Skirbekk and Philipov 2011; Comolli 2017; Carella and Heins 2018; Matysiak, Sobotka and Vignoli 2020). The Great Recession is a term that represents the sharp decline in economic activity during the late 2000s. The term Great Recession applies to both the U.S. recession, officially lasting from December 2007 to June 2009, and the ensuing global recession in 2009. The Great Recession has renewed interest in the role of economic uncertainty in family dynamics. At micro-level the studies that address this topic are expanding very rapidly (e.g., Kreyenfeld, Andersson and Pailhé 2012; Vignoli, Drefahl, De Santis 2012; Vignoli, Rinesi, Mussino 2013; Modena, Rondinelli, Sabatini 2013; Barbieri et al. 2015), but despite the prevailing conviction that economic uncertainty discourages people from having children, empirical evidence is mixed (Sobotka et al. 2011; Kreyenfeld et al. 2012; see Alderotti et al. 2020 for a meta-analysis of published European research on the topic). Atypical type of contracts, unemployment, and unstable employment situations are usually found to induce a postponement in childbearing (Adsera 2004; Özcan, Mayer, and Luedicke 2010; Pailhé and Solaz 2012; Kreyenfeld and Andersson 2014), especially among childless couple, who put off their plans of family formation (Neels, Theunynck and Wood 2013). Conversely, other studies show that the women in non-permanent employment may decide to have a child because

motherhood may increase their social status and make the future safer (Edin and Kefalas 2005; Kreyenfeld 2010). According to this point of view, individuals, especially women, can take advantage of employment uncertainty to have child, particularly if they can count on other revenue (Mills and Blossfeld 2005; Vignoli, Drefahl and De Santis 2012) or even if they have little to lose about their future work perspective (Friedman, Hechter and Kanazawa 1994). Even unemployment situation has a different effect in household for men and women that are in the labour market. In fact, countries with lower wages and female labour market participation rates experience a higher incidence of households in the unemployment state, with strong negative effect on fertility (Ahn and Mira 2002). Recently, childbearing and especially transition to first birth are influenced by the increase in competition in the labour markets and in demands for workers' flexibility by the employers' (Mills and Blossfeld 2005; Kreyenfeld 2009). The difficulties in finding a job may induce women to postpone childbearing until they reach a better position in labour market (e.g. McDonald 2006; Vignoli, Tocchioni and Mattei 2019). Furthermore, a great deal of research, showing relevant gender differences in work and family involvement during the transition to parenthood and to higher order births, suggests that couple-level research is warranted (Singley and Hynes 2005; Klesement et al. 2014). Indeed, several studies have shown that, among couples, gender becomes more salient during the transition to parenthood (Cowan and Cowan 1992; Sanchez and Thomson 1997). So, omitting the couple dimension leads to an overestimation of the negative effect of women's employment on fertility (Matysiak and Vignoli, 2008).

Permanent work, however, is not always synonymous of certainty and precarious work not always means uncertainty. For some types of work, short-term contracts, or dispatch work are the norm therefore they are not perceived as uncertain. In particular, temporary jobs can be attractive when they refer to top-level professions (Blossfled 1997; Hakim 1997). Besides if fixed-term work is voluntary, this can improve job satisfaction and quality of life (Guest and Clinton 2006), rather than leading to an increase in economic uncertainty (Kallberg 2009). Employment uncertainty not only acts directly on fertility through an increase in uncertainty within couples, but also indirectly through the lack of income thus making it more difficult for families to choose to have a child because of a lack of an appropriate income. So, we do not consider employment uncertainty as the only driving force for the decrease in fertility detected in Europe in last decades. In fact, another marker of economic uncertainty is the lack of income. Many couples choose not to have one or more children not only in response to a situation of uncertainty but also because they cannot afford it because of the low income due to unemployment and limited-time work.

Specifically, the thesis addresses four main aims: (1) to establish the relation between economic uncertainty and fertility in Europe, considering men's and women's characteristics jointly; (2) to understand whether one of the two uncertainties (the man's or the woman's) is more important than the other in childbearing; (3) to verify if the effect of the employment uncertainty is "explained" by the lack of income; (4) to study the possible presence of a relation between the Great Recession and fertility, differentiating for European macro-areas (North, South, East and West).

In order to develop models that can address the issues that we focus on, we use the longitudinal section of EU-SILC (European Statistics on Income and Living Condition) dataset. The EU-SILC dataset contains information about individuals and households by collecting a wealth of economic, demographic, and social characteristics. Moreover, this type of data allows us to reconnect each member of the couple and each child to the parents (assuming that, the child still lives in the same household). Using these data, we can introduce in the model of fertility the employment uncertainty faced by partnered men and women jointly, because uncertainty may affect the partners in different ways. Furthermore, to account also for the effect of lack of income, and not only that of employment uncertainty, we insert in the model the equivalised income of both partners.

The data we use in this analysis have a nested structure: couples are followed for several years and they are nested into countries. So, the models that we use to study the relationship between employment uncertainty and fertility take into account this nested structure as well as the heterogeneity between the different European countries. Hence, for our purpose, multilevel models rather than traditional single-level techniques better answered to our research questions (DiPrete and Forristal l994; Hox and Kreft 1994). Multilevel models are a means of investigating complex between-place and between people differences, by also providing a way of assessing for which types of people contextual effects matter. We use, specifically, a multilevel discrete-time hazard models with random slope and intercept.

This research is composed by five chapters. In the first one, we outline the theoretical background which is the basis of our subsequent analyses. First, we present a literature review about the theme of decline in fertility and its relations with employment uncertainty, with specific attention to the association with unemployment and limited-time jobs. We sustain the importance of adopting couple approach, as fertility decisions are not taken by men and women in isolation. Moreover, we present a theoretical part about the relation between higher order births and employment uncertainty. Then, we describe the different welfare regimes across the European countries, in terms of policies that support both in monetary and non-monetary way the work/family reconciliation. Afterwards, we present the phenomenon of the Great Recession, describing the initial phase and the subsequent effect

on the European economy, labour market, and fertility. After outlining the theoretical part, we report some descriptive statistics about the TFR (Total Fertility Rate), unemployment rates and precarious job rates across the European countries. Finally, in this first chapter, we outline the research questions to which we try to answer with the following models and analysis. In the second chapter, we present the data that we use, that is the EU-SILC dataset. Moreover, we report some descriptive statistics about the dataset composition in terms of covariates and an analysis about sample attrition.

In the third chapter, we describe the models that we use, and the methods used to verify the goodness-of-fit of these models. Because we are interested in analysing the relation between Great Recession and fertility across European countries, we describe in this chapter also the structural breaks theory that we use to verify if there are a change in the parameters of the models in the years around the beginning of the crisis.

In the fourth chapter, we present the results of the analysis of the conception of the first child, obtained using the multilevel models described in chapter three. Moreover, we show the result of the structural break analysis, that verify the presence of a relation between the Great Recession and fertility across Europe. In the fifth chapter, we replicate the analysis made for the conception of first child in the case of second births. We show, also in this case, the results of the multilevel models and the structural break analysis.

The last chapter of the thesis summarise the main findings in relation to our research questions; specify the contribution of this work to the international literature; recalls the major strengths and limitations of the analysis; and provides input for future research.

1 Employment Uncertainty and Fertility

This first part aims to outline a theoretical background that is the basis of subsequent analyses, aimed to studying the relationship between economic uncertainty and fertility across European countries. We start with a literature review about the relation between economic uncertainty and decline in fertility in Europe. In particular, we concentrate on the employment uncertainty used as proxy of economic uncertainty, and specifically on (un)employment and limited-time job. Despite the uncertainty may influence couples as a whole, most of the previous research study the causes of decline in fertility using only the women or men characteristics separately. So, we describe the importance of considering both the men and the women characteristics jointly in the models to avoid misleading results. Then, we extend this theoretical background also to the case of higher order births, reporting a literature review about the relation between decline in fertility and transition to higher parities. Since our aim is to analyse the relationship between employment uncertainty and fertility in Europe, we report a chapter which illustrates the different welfare regimes. We describe the difference across the countries in terms of labour market policies and monetary and non-monetary support to family/work reconciliation.

The renewed interest in studying the uncertainty/fertility link also stems from the onset of the Great Recession. So, we describe in a separate chapter all the phases of this crisis in the European context. Once the theoretical background has been outlined, we display some descriptive statistics about TFR, employment and precarious job rate in Europe. These statistics help us to show the situation across the European countries, in the years in which our analysis focuses. Finally, the research questions to which we will try to answer in this work are reported.

1.1 Literature Review

During the 1990s economic uncertainty became an important factor in the explanation of the decline in fertility and the postponement of family formation across Europe, especially, when the aims was to explain the developments observed in Southern and post-socialist Central and Eastern Europe (e.g. Kohler and Kohler 2002). Indeed, in most of the countries experiencing a transition from a controlled economy to a market-based economy, it is observed a decline in birth rates (Ranjan 1997). The increasing uncertainty gives rise to a threshold behaviour: individuals above the threshold level of income want to have a child immediately, while those who are below the level wait for the uncertainty to be resolved. In general, an increase in uncertainty about future income can lead people to postpone their childbearing decision. In the lowest-low fertility countries the timing of fertility is therefore likely to be sensitive to changes in the socioeconomic conditions; so, a postponement can reduce

uncertainty associated with the economic situation and the stability of partnership for the young people (Kohler et al. 2002). In general, this uncertainty provides an incentive to delay decisions that imply long-term commitments, such as children, and it provides an incentive to invest in education and human capital. This means that young adults, tend to study for a longer time to improve their ability to cope with the economic uncertainty.

Economic uncertainty has become a part of the contemporary globalized societies, that is characterized by phenomena such as internationalization, deregulation of the labour market and delocalization. These structural shifts due to globalization, are linked with domestic institutions (welfare regimes, employment, education) and in turn impact the individual life course and family formation (De la Rica and Iza 2005; Gutierrez-Domenech 2008). Countries, to become competitive, tend to converge to lower standards, especially in labour market; this brings to a less protection and lower working conditions and pay for employees in low-income countries. The mechanism of intensification of competition also rises the instability of markets (Streeck 1987). Moreover, to increase competitiveness, governments enact: policy measures to remove or relax regulation of economic activities (deregulation); shift toward reliance on the price mechanism to coordinate economic activities (liberalization); and transfer private ownership and control of assets or enterprises that were previously under public ownership (privatization) (Mills and Blossfled 2013). These policies have consequences for individual employment careers and subsequent family formation. In particular, deregulation leads to less employment protection means fewer constraints from downsizing, layoffs, and ease in introducing further labour market flexibility measures (Auer and Cazes 2000). Privatization, instead, results in changes from more to less protected public sector jobs (Standing 1997). All these mechanism makes long-term developments of globalizing markets harder to predict. So, the increasing speed, dynamics, and volatility of outcomes of globalizing markets makes it more difficult for individuals to predict the future and to make choices between alternatives and strategies, this involves uncertainty at all levels (Mills and Blossfeld 2013). The problem is not only which alternative to choose but also when to choose it. All this leads to an employment uncertainty that is characterized by whether people are in the more stable position of being dependent workers or the more insecure position of being self-employed, temporary worker or unemployed. The uncertainty in this context is also related to the protection measures afforded in different employment regimes (Mills, Blossfeld and Klijzing 2005). In addition, the types of work characterized by low protection measures are also those that have, typically, low income, which entails a reduction in family resources which therefore will tend to postpone the decision to have children.

The influence that economic uncertainty has on fertility depends on several individual features such as age, education, partnership status, income, and main activity status and work characteristics. Young women, unlike those who are at the end of their reproductive life, are more likely to postpone parenthood (Kreyenfeld and Andersson 2014; Currie and Schwandt 2014). Furthermore, women with higher education, as they have better chances to reach more prestigious position in the labour market, might be more likely to delay childbearing (Kreyenfeld 2009; Pailhé and Solaz 2012). Overall, several studies find that uncertainties deriving from unemployment and precarious contracts tend to inhibit family formation in Europe (Kohler and Kohler 2002; Goldstein, Sobotka, and Jasilioniene 2009; Scherer 2009; Hondroyannis 2010). In order to synthetize European research findings and to offer a general conclusion about the effect of employment uncertainty on fertility Alderotti et al. (2019) use a network meta-analysis, which also allows to rank different sources of uncertainty. From this type of analysis turns out that for men, being unemployed is more detrimental for fertility than having time-limited employment; vice versa for women, time-limited employment is more detrimental for fertility, while unemployment is viewed as chance for having children. Moreover, the negative effect of time-limited employment on fertility has become stronger over time, especially in Southern European countries.

We use for our purpose, unemployment, and job (in)stability as indicators of economic uncertainty. These two indicators are often used in literature as proxy of employment uncertainty, moreover the uncertainty they generate has an impact on family formation or reduction of family size across European countries (Blossfeld et al. 2005; Kohler and Kohler 2002; Vignoli, Drefahl and De Santis 2012; Vignoli, Tocchioni and Salvini 2016; Vignoli et al. 2020a, b).

1.1.1 Unemployment and Fertility

Most of the previous research on fertility decisions are based on the neoclassical economic model based on extensions of Becker's theory (Becker 1981; Bernardi, Klärner and Von der Lippe 2008). This theory contends that children are costly both in economic and social terms, moreover they involve a high expenditure also in terms of time. Most of the studies that conceive fertility using the neoclassical model also assume that traditional gender roles are common and persistent. For men, it emerges a negative effect on fertility directed related to the influence of unemployment on income. In fact, unemployment leads to a lack of income that reduces household resources and this in turn involves, for men, a postponement of family formation (income effect) (Kohler and Kohler 2002). Moreover, from a women's perspective, unemployed men are less attractive to be chosen as fathers (Kravdal 2002). For women, the predicted effects deriving from neoclassical models are twofold. On

the one hand, we observe the same income effect seen for men, that is, being unemployed leads to a decrease in income and therefore less resources for children. On the other hand, for women, a decrease in income can also mean a reduction in the opportunity cost of spending time caring for children (substitution effect). The impact of unemployment might also depend on its duration. In fact, temporary periods of unemployment can be viewed as less expensive periods to have children (Adserà 2004). Instead, if unemployment becomes persistent, then pregnancy might imply greater difficulty in returning to the labour market. So, the expectation of a short unemployment spell might have no impact or a positive impact, whereas the expectation that the period of unemployment will be long or persistent should have a negative impact (Özcan, Mayer and Luedicke 2010).

In recent years numerous gender-specific (women or men) studies have been done about the relation between unemployment and fertility (Engelhardt, Kögel and Prskawetz 2004; Baizán 2005; De la Rica and Iza 2005; Mills and Blossfeld 2005). In these studies, the use of individual-level or aggregate data are important because the relationships at the micro and macro levels may be dissimilar (Rindfuss and Brewster 1996; D'Addio and Mira d'Ercole 2006). But as in the case of neoclassical economic model the result for men and especially for women are not conclusive and sometime conflicting (Baizán 2005; Sobotka, Skrirbekk and Philipov 2011). At the individual level, emerges a negative impact of male unemployment on fertility in most of the European countries, maybe due to the persistence of male breadwinner model (Noguera, Golsch, and Stainhage 2002; Ahn and Mira 2001; Mills and Blossfeld 2005; Schmitt 2008). Although the effect for men is predominantly negative, some studies have also found no effect of male unemployment on fertility in the UK and only for young men in Denmark (Francesconi and Golsh 2005; Kreyenfeld and Andersson 2014). The results for female unemployment are more heterogeneous, sometimes showing a different nexus with respect to birth parity and mother's age. A positive impact of female unemployment on the transition to first motherhood has been verified for many European countries (Liefbroer and Corinj 1999; Andersson 2000). The positive effect of the unemployment, for women may be due either because unemployed women are pessimistic about her chances to find a job and hence may want to use the waiting time to have a child (Hoem 1998b; Schmitt 2008), and in this way have more time to devote to childbearing and childrearing. Moreover, the positive effect of female unemployment on fertility often occurs when in the family is still present a gender division of labour. Conversely, other studies find that being unemployed leads to greater uncertainty about the future, both in terms of duration of unemployment and about future job opportunities (Inanc 2015). This leads to a negative effect between women's unemployment and fertility in several countries (Impens 1989; Hoem 2000; Andersson and Guiping 2001; Meron and Widmer 2003); unemployed women may postpone

childbearing in the expectation of better times. Moreover, Kreyenfeld (2009) did not find any statistically significant impact of unemployment on women's transition to first birth in western Germany. In sum, from the individual-level emerges that in European countries where male breadwinning capacity is crucial and labour market institutions are primarily oriented toward male workers (e.g. Italy, Spain, and Germany) female unemployment is positive associated with fertility. Instead, in countries where female employment is widespread and facilitated by institutional contexts (e.g. Northern countries) a negative relationship between unemployment and fertility behaviour has been found.

At the macro level, Lanzieri (2013) analysed total fertility rate of employed and non-employed women across European countries. From that study emerges that in some Southern countries (e.g. Portugal and Spain), non-employed women have lower fertility than employed women. Instead, for several Central and Northern countries (e.g. Germany and Norway), non-employed women show higher fertility. The differences found between European countries are probably due to the fact that institutional contexts and labour market institutions exert an important role on the relationship between unemployment and fertility behaviour.

1.1.2 Limited-time jobs and Fertility

Recently, in addition to unemployment it is considered the type of employment contract (permanent or temporary) (Sutela 2012; Pailhé and Solaz 2012). These new types of contract have both positive and negative aspects. On the one hand, temporary employment may be additional job opportunities for those outside the labour market (OECD 2002). Sometimes, these kinds of flexible contracts, albeit unstable, are not connected to a lower job satisfaction or low income; in fact, in some cases, especially for highly skilled workers, they can increase job satisfaction and wages (Kalleberg et al. 2000; Guest et al. 2006). Moreover, temporary contracts provide for a fewer hours of work compared to classic unlimited-time contracts; this can be a help, for individuals that give priority to family life over career, to combining work and family (Scherer 2009; Pirani and Salvini 2015). On the other hand, these kinds of jobs, due to low level of labour market integration, are often characterized by a lower income and lower employment protection (Schmitt 2012b). Individuals with time-limited contracts tend to be less satisfied of their jobs and have worse physical and mental health, which in turn affect family life (Vignoli, Mencarini and Alderotti 2020). This because people who have precarious job contract tend to have more monotone and stressful work with little control over working hours (Benavides 2000; Kalleberg 2009; Pirani 2017). Often women are overrepresented in temporary employment, probably due to the greater family responsibilities they have (Schmitt 2012b).

The relationship between precarious work and fertility is not as clear as one might think. Especially for women, the effect of precarious work on fertility is ambiguous for the same reasons found in the case of unemployment. In fact, there are some studies that, about the decision to have the first or another child, not find any significant differences between people with time-limited or unlimited type of contract (Wolbers 2007). A study finds, in Netherland, that unlimited work contract affects first birth, while precarious job does not (Lange et al. 2014). On the other hand, there are a lot of studies that, analysing different European countries, find a negative relationship between precarious work and fertility (Baizán 2005; Blossfeld et al. 2006; Lundstrom and Andersson 2010; Dupray and Pailhé 2018). In general, this type of employment uncertainty has a more detrimental effect for women than man in couples were there is gender-differences in the relationship between time-limited employment and fertility (Pailhé and Solaz 2012).

1.2 The couple approach

In the first part of 20th century the family model that emerges more is the male breadwinner-female caregiver, characterised by a strong gender division of the labour. In this type of family model, the man has the responsibility to establish a solid labour market position and secure financial resources, while the woman responsibility is to have time to childcare. In the second part of 20th, the gender differences in the public sphere decrease and dual earners households rise, due also to the increase in the women labour market participation and educational attainment (Goldscheider, Bernhardt and Brandén 2013). This increasing symmetry in public gender roles could decrease the asymmetrical gender roles in the family, which in turns make both partner main activity status relevant with respect to the decision to have a/another child (Marynissen et al. 2020). Even though the partners' characteristics jointly, especially in term of employment, influence family formation and enter into parenthood, much of the research consider only women's labour market position. The research that evaluate the potentially gendered nature of the relation between employment and fertility often consider women's and men's family and work histories separately (Liefbroer and Corijn 1999; Winkler-Dworak and Toulemon 2007; Dribe and Stanfors 2008; Hart 2015). So, only few studies investigating the partners' characteristics together, even if different characteristics of both partners may play an important role in determining childbearing (Corijn, Liefbroer, and De Jong Gierveld 1996; Dalla Zuanna 2001; Pinnelli and Di Giulio 2003; Kaufman and Bernhardt 2012; Schmitt 2012; Vignoli, Drefahl and De Santis 2012; Begall 2013; Jalovaara and Miettinen 2013; Trimarchi and Van Bavel 2018). Leaving out the couple perspective led to overlook the importance of partner's employment status in fertility decisions (Inanc 2015). The successful integration of both partners and the presence of dual-earners model can increase household income and help to cope with the

economic uncertainty (Esping-Andersen 1999). Microeconomics theories suggest that, at the couple level, certainty about future employment position and sufficient financial means are positively associated with the transition to parenthood (Becker 1981). This favourable situation, in term of economic assets is more likely if both partners contribute to these household-level labour market resources.

The decision to have a/another child, depends not only on the main activity status and financial characteristics of the members of the couple, but also on the degree to which family policies facilitate work and family reconciliation. So, also the context matters, because the link between fertility and labour market participation of both partners depends on type of welfare state and on cultural and labour-market characteristics (Baizán 2005). In the absence of possibilities for combining work and family life and the presence of a gender unbalance division of unpaid work within couples, for women increasing career and income option lead to the fact that women tend to replace work with childbearing (substitution effect). By contrast, for their male partners increasing career and income options favour fertility decisions (income effect) (Becker 1991). Increases in possibilities of combining work and family life, may have as a result that for women income effect dominates the substitution effect. In those countries where parents can successfully combine these two aspects, women's labour market participation is likely to facilitate the decision to start a family: the negative substitution effect of female employment on fertility gets weaker while the positive income effect gets stronger. The overall association between economic downturn and fertility depends on the relative size of these income effects for male and substitution effects for female (Butz and Ward 1979; Ciganda 2015), which in turn is influenced by the degree of specialization between spouses. In general, the overall impact of changing employment circumstances will be positive, negative or zero depending on the magnitude of the negative income effect for men and the positive substitution effect for women (Sobotka et al. 2011). In situations where men's and women's economic contributions to the household are similar, the relationship between fertility and changing employment circumstances is expected to be negative (Raymo and Shibata 2017).

So, failure to account for the employment circumstances of both men and women in models of fertility may produce results that are misleading in ways systematically related to the context in which they are observed. In general, couple-level research is warranted in those settings where significant gender differences exist in work and family aspects (Singley and Hynes 2005). Moreover, looking at the meta-analysis of micro-level studies on the relationship between female labour-force participation and fertility (Matysiak and Vignoli, 2008), it emerges that using both men's and women's information is useful to analyse the fertility process. In fact, omitting this dimension leads

to an overestimation of the negative effect of women's employment on fertility. In light of what has been said it is quite likely that the decision to have a/another child depends on both partners' socioeconomic resources and that economic uncertainty is a factor that may discourages this decision for both partners.

1.3 Higher order births

In recent decades in almost all European countries there has been a decline in fertility levels mainly due to a decline in cohort fertility at higher parities rather than increasing level of childlessness (Billari and Kohler 2004; Sobotka 2008). This is because couples believe that the advantage to have a child outweigh the disadvantage, in a context where the desire to become parents is still strong (Bernhardt and Goldscheider 2006). So, the couple does not want to remain childless, but rather tend to limit the family size (Kohler et al. 2006). The extent to which couples progress to a higher parity varies across European countries. Often the decline in childbearing rates has been attributed to the rise in female labour-force participations. However, there have always been substantial differences in the labour market activity of women across European countries, but in recent years seems to emerge a different pattern. In fact, in some countries where the female labour-force participation is high, the births rates are higher than the other parts of Europe (Brewester and Rindfuss 2000). Some countries supported and encouraged individual female autonomy and worked towards achieving compatibility between work and family life. Instead in other countries, without favourable family-friendly policies, it is harder for women to combine both aspects. So, having an additional child may reduce the chance to have a more stable employment (Baizán 2005). In general, the impact of employment on childbearing varies by gender and parity. In fact, for childless women and men being in a full-time employment is an important factor in the decision to have the first child. This consideration holds also when it is considered the partner's employment. Instead, if couples have to decide whether or not to have the second or a higher-order child the effect of employment status change by gender. Women's employment does not affect the intention to have another child, instead men's employment is still an important factor in this decision. Moreover, for women the partner's employment increase the intention to have another child, instead for men the partner's employment does not influence this decision (Neyer, Lappegård and Vignoli 2013).

A large part of women stayed childless or opted to small family to avoid the problems involved in combining the role of mothers and full-time employee (Köppen 2006). Important, in that sense, is the organization of work and childcare, which have been considered to lead to variations in the degree of conflict between work and family life across European countries (Rindfuss and Brewster 1996). In fact, it is after the first child that parents face with the difficulties linked to the childcare and with the

time and energy to spend in that activity (Presser 2001). Moreover, it is after the first child that working women are facing with the problem of combining the two roles of mother and worker (Oláh 2003). In different welfare state regimes, the family, the state and the market have a different degree of responsibility in providing child-care, and the labour market is regulated according to different models of participation during the period around the childbirth and when low age children are present in the household. The incompatibility, for women, between work and family life can be reduced, by policy measures such as parental-leave programs and public childcare but also by fathers' engagement in active parenting and a more egalitarian division of household work between partners (Bernhardt 1993). If after first birth father are not or little involved in childcare, it is possible that the demand of time to childcare is too much for mother, which can opt to stop at the first child, especially in the absence of external aid and adequate support policies (Mencarini 2006). Couple with more equal share of family responsibilities joint to policies that facilitate the work-family balance for either parents show greater higher-order births intensity than others (Oláh 2003).

1.4 Welfare regimes

The ability to combine work and family life also depends on country-level factors; the country's degree of support to this problem and the relation between female employment and fertility might differ across Europe (Giorgetti 2017). The labour market policies (unemployment benefits, assistance in job searches, employment protection) can positively influence the relation between fertility and job uncertainty by affecting the ease to find a job after a period of unemployment or the possibility to have financial support or also better chance of entering employment (Adserà 2004, 2005, OECD 2006; Caroleo and Pastore 2007). In general, unemployed or in fixed-term contracts men are more likely to postpone parenthood in countries where labour market is more traditional. In these countries seems that women's economic careers are less important than their male partners (Schmitt 2012b); so, women tend to be less present in the labour market and to use unemployment or temporary employment to have a child. Among European countries arrangements of labour markets and gender division of labour are very heterogenous. Welfare systems differ in type and level of support they provide for families and career and thus influence the economic consequence that certain family events may involve (Saraceno, Lewis and Leira 2012).

The negative consequence of labour market deregulation for careers and earning vary across different institutional settings. Nordic countries are those that provide the best policies in term of work and family reconciliation, reducing the work-family trade-off and supporting the demand for female labour. These countries are characterized by labour market policies that facilitate entry into employment (Esping-Andersen 1999; Thévenon 2011), re-employment of mother after family-related

breaks, and flexible work arrangements in terms of part-time employment and working hours. Furthermore, in Nordic countries there is a high women's labour force participation and a more egalitarian division of household labour (Kan et al. 2011; Altintas and Sullivan 2016). In Western European countries, the situation is more heterogenous. Belgium and France are characterized by family friendly policies that encouraging mothers' employment. In the Netherland, instead policies towards flexible work arrangements prevail. In the UK, despite the high flexibility of the labour markets and relatively short unemployment spells (Adserà 2004; Caroleo and Pastore 2007), women's participation in the labour force is moderate, and usually in part-time employment (Connolly et al. 2016), instead for men work involves long hours and therefore they have less time for families compared to women in part-time job (Adler and Lenz 2015). In Anglo-Saxon countries, the relative deterioration of employment for workers in non-standard positions has been limited when compared with the working population (Esping-Andersen and Regini 2000; Gash 2008). Southern European countries display high difficulties in combining family life and women's employment. In fact, there are not suitable policies for supporting reconciliation between work and family or financial support towards them. In these countries are present a strong partial and targeted labour market deregulation policies, which led to a risky insider outsider scenario (Barbieri 2009; Blossfeld et al. 2008). Moreover, the labour market entry is characterized by strong barriers and the work arrangements are more rigid than elsewhere. In Southern countries the male breadwinner model that maximizes, on the one hand, men's income security and, on the other, women's time availability at home, generally, still prevails. Central and Eastern countries (CEE) are characterized, in general, by difficulties in combining fertility and women's labour force participation. When children are young women opt for a reduction of labour force involvement (part-time work), along with preferences towards their ceasing work altogether while, when the children are older the couple preferred dual-earner model where also women work and contribute to the household income (Kotowska and Matysiak 2008). As in Southern countries, also in Central and Eastern ones the work arrangements are very rigid. The situation in these countries, in terms of policies towards work and family life reconciliation, is very heterogeneous.

The decision to have a/another child implies new responsibilities, needs and constraints due to childrearing and so a rearrangement of work/family balance. The presence of social policies that provide income support and opportunity to reconcile work and family life presents significant variation across Europe countries. These variations are often linked by the different norms about the role of women in the society (Esping-Andersen 2007b; Thévenon 2011). In particular, the Northern countries give support to working parents with young children and promote gender equality by a combination of available public childcare and income-related leave arrangements (Oláh and Bernardt

2008; Rønsen and Skrede 2008; Lappegård 2010). In the Southern countries, instead, the period for child-related leave is shorter than in Northern ones and there is limited availability of childcare services (Delgado, Meil and Zamora-López 2008; De Rose, Racioppi and Zanatta 2008; Baizán 2009). Moreover, these countries are characterised by a "deficit" of family and child related policies and a persistence reliance on family support (González 2006; OECD 2011). In Western Europe the situation is less homogeneous in term of balancing work and family life. In France and Belgium there are several family policies, as long and well-paid parental leave (especially when children are young), whose purpose is the reconciliation for women between employment and childcare (Breton and Prioux 2005; Toulemon, Pailhé and Rossier 2008). In these countries the strategy is mixed, on one hand the women are valued and rewarded for providing care, on the other hand are also encouraged to engage in full-time employment (Del Boca, Pasqua and Pronzato 2009). Netherland remains closer to the "male breadwinner-female caregiver" model, supported by high family allowances and with a considerable role of part-time work that is principally women segregated (Barbieri and Bozzan 2016). UK, instead, encouraging mother employment, mainly part-time, and private welfare provision, thus limiting public responsibilities (Esping-Andersen 2002). Finally, in Central and Eastern countries public support for families is limited and fragmented; long working hours often add the lack of public childcare support for working parents (Thévenon 2011).

1.5 The Great Recession

The Great Recession is a world economic crisis that occurred between 2008 and 2013 that broke out in the USA in 2007. This crisis that hit global economy since 2008 is without precedent in post-war economic history. The Great Recession was preceded by relatively long period of rapid credit growth, low risk premiums, abundant availability of liquidity, strong leveraging, soaring asset prices and the development of bubbles in the real estate sector. Stretched leveraged positions and maturity mismatches rendered financial institutions very vulnerable to corrections in asset markets, deteriorating loan performance and disturbances in the wholesale funding markets (EU economy 2009).

In its early stage, the crisis manifest itself as an acute liquidity shortage among financial institution as they experienced major difficulties to rollover their short-term debt. At that stage it was believed that the European economy, unlike the US economy, would be largely immune to the financial turbulence (Marlier, Natali, Van Dam 2008). This belief stemmed from the fact that the real economy, albeit in slowing, grew thanks to rapid export growth and solid financial positions of households and businesses. These perceptions changed in 2008, associated with the bankruptcy of

Lehman Brothers taking down major US and Europe financial institutions in its wake (Blanchard 2009). The downturn in markets accelerated rapidly across the world. World trade declined sharply, and businesses dropped sales resulting in increased inventories, as the trade credit became scarce and expensive. Confidence of both consumers and businesses fell to lows. The financial crisis has had a widespread impact on the real economy of the EU, and this in turn led to adverse feedback effects on loan books, asset valuations and credit supply. But some EU countries have been more vulnerable than others, reflecting differences in current account positions, exposure to real estate bubbles or the presence of a large financial centre (Hrstov 2012).

The Great Recession has had an impact not only financially but also in the labour market and in the budgetary position of the European countries. Labour markets in the Europe started to weaken considerably in the second half of the 2008, deteriorating further in the course of 2009 (Marlier, Natali, Van Dam 2008). In the second quarter of 2009 the unemployment rate had increased by 2.2 percentage points from its 6.7% low a year earlier. The sharpest increases in unemployment have been registered in countries facing the largest downturns in activity, for example the Baltic countries (European Commission 2010). In the early phase of the crisis, the bulk of job losses were concentrated in just a handful of European countries, largely as a result of pre-existing weakness as well as a larger exposure to the direct consequences of the shocks. As the crisis subsequently put a widespread brake on domestic demand across the whole of the Europe, at a time when external demand was already vanishing, employment has been falling in all European countries since the first quarter of 2008. The socio-economic groups with relatively loose work contracts (i.e. temporary contracts and self-employed) and the low and medium skilled were the worst negatively affected by recession so far (European Economy 2009).

From a budgetary positions point of view, it is observed that the distribution of the increases in fiscal deficits is uneven across EU, even though the fiscal positions have deteriorated everywhere (Brunet 2011). Another issue in this context is that public indebtedness is rapidly increasing. This is the case not only because fiscal deficits are normally debt financed, but also because governments have implemented capital injections in distressed banks and granted guarantees that are debt financed. Another striking features, of this financial crisis has been the substantial widening in sovereign risk spreads and the downgrading of the credit ratings of some European countries. The European sovereign debt crisis started in 2009 when several countries reported larger-than-expected increases in deficit/GDP ratios. In addition, the scale of the recession and rising estimates of prospective banking-sector losses on bad loans in a number of countries also had a negative indirect impact on

sovereign bond values, since investors recognized that a deteriorating banking sector posed fiscal risks (Mody and Sandri 2012, Lane 2012).

The onset in 2008 of the global financial crises swept across Europe renewed interest in the question of whether the impact that the Great Recession had from a financial, fiscal and labour market (rising unemployment rates and growing uncertainties) point of view will also have repercussions on fertility dynamics. In general, changes in fertility in response to the crisis have not been universal. In fact, fertility rates have declined in response to the crisis in several countries instead in other countries, the economic crisis disrupted the positive fertility trend that began around the turn of the century (Goldstein et al. 2013). There are numerous studies that, over time, have investigated the link between economic uncertainty and fertility. These studies based on aggregated-level data, show that fertility is pro-cyclical and tends to decline in period of economic downturns (Sobotka, Skirbekk and Philipov 2011). So, in times of crisis people tend to postpone childbearing rather than use the period of uncertainty to form or expand the family (Matysisak, Sobotka and Vignoli 2020). Studies regarding the relation between the Great Recession and fertility are numerous in the USA. Period of crisis and rising uncertainty at macro-level led to an increase in unemployment rates and this in turns has influenced the decline in fertility (Schneider 2015). In contexts of economic downturns, the first births rate tends to decrease, and this involve an increase in childless couples (Comolli and Bernardi 2015). Moreover, long-term negative influence of job displacement, labour market polarization and deindustrialization led to a decline in fertility that continue even after the end of the crisis period (Seltzer 2019). In recent years, research has also increased at European level on the issue of the effect of the Great Recession on fertility. Although some of these studies have a descriptive character (Lanzieri 2013) or are related to a single country (Pailhé and Régnier-Loiler 2015; Cazzola, Pasquini and Angeli 2016; Hilamo 2017; Tragaki and Bagavos 2019), there are also researches with a comparative perspective, based on county-level data. Most of these studies find that an increase of unemployment rate, during economic downturns, was related to a decline in fertility rates across European countries (Goldstein et al. 2013; Bellido and Marcén 2016; Comolli 2017). A study relative to the Nordic European countries show a uniform negative fertility response to the economic crisis across countries and education groups, differently from the more differentiated fertility developments by social groups in the previous downturn period (Comolli et al. 2019). Another study finds that indicators of job insecurity (short and long-term unemployment), were more related to fertility respect to subjective indicators, that varied by context, of job perceptions (Ayllón 2019). Given the fact that the change in fertility dynamics in response to the crisis, across European countries, depend on

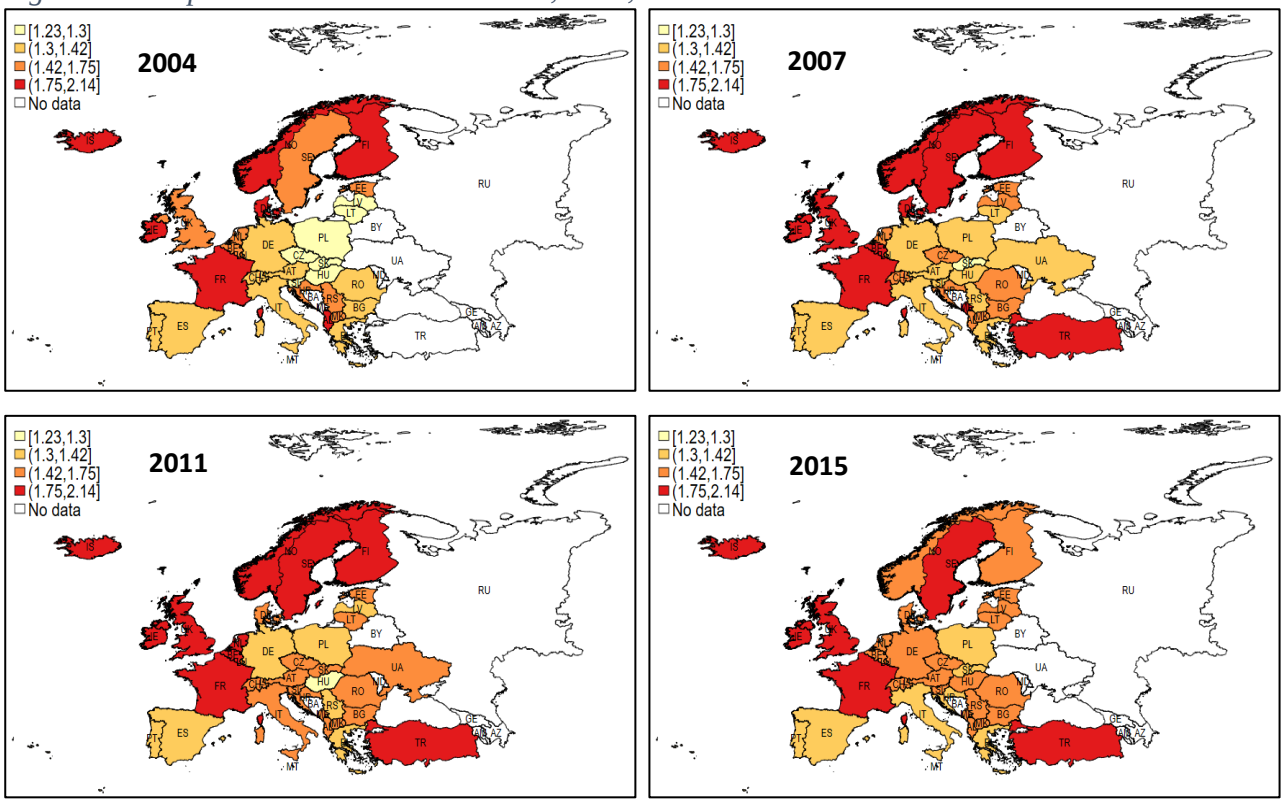
different circumstance and normative constraints this study also focuses on another issues: asses if the Great Recession has influence in fertility behaviour across European countries.

1.6 Europe: The background

The relationship between the economy and population dynamics has long been discussed but is still controversial. Fertility is commonly assumed to be affected by the economic cycle, for example in periods of economic downturns and vice-versa. In fact, the majority of the evidence on fertility changes in Europe after 2008 (that is the start of the Great Recession) indicates fertility declines. The increase in fertility rates that started around the turn of the century reach its highest value in 2008-10; thereafter fertility rates declined in almost all European countries. The turnaround in previous increase in period fertility has been more evident in those countries that experienced stronger economic downturns and faster increases in unemployment (Lanzieri 2013). Change in fertility in response to the global financial crisis swept across Europe in 2008 have not been universal. Fertility rates have declined in response to the crisis in several countries, while in other countries, the economic crisis disrupted the positive fertility trend that began around the turn of the century (Goldstein, Kreyenfled, Jasilioniene and Örsal 2013). If we are looking at the TFR's trend in Europe before and after the Great Recession, we note a negative trend after the start of the crisis even if this decrease not have the same start in time for all the countries. For example, in Greece the TFR increases to a value of 1.5 in 2009, thereafter it is observed a decline up to a value of 1.3 in 2014. A similar reversal in positive fertility trends occurred also in Bulgaria, Croatia, Poland, Serbia, Iceland, Latvia and Norway. In the others Nordic countries, instead, the decline in TFR start from 2011 as in Belgium, Estonia and France.

Currently almost all the countries in Europe have TFRs that are below the replacement level and the average of TFR in Europe (EU-28) is, on average, 1.57 (Eurostat 2004-2015; we stop at 2015 because our data arrive until this year). In general, Southern and CEE countries tend to have lower TFRs than Western and Northern ones. From Figure 1 emerges that, in general, from 2011 to 2015 TFR dropped in many European countries.

Figure 1: European countries' TFRs in 2004, 2007, 2011 and 2015

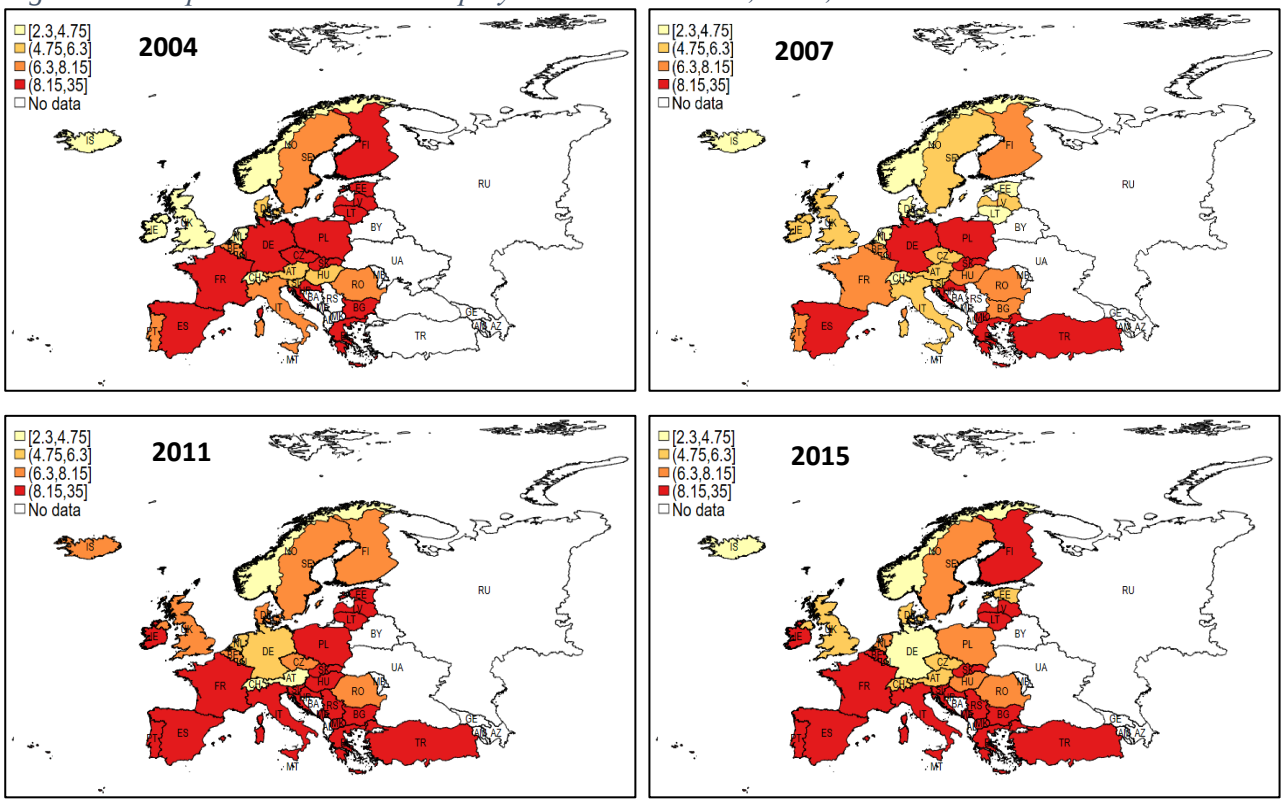


Source: authors' elaboration on EUROSTAT TFR data
Note: for the class division we use the same quartile division of 2004 also for the other years

Regarding labour market: female activity rate [1]of the 15-64 years age group in EU-28 increases steadily from 61% in 2003 to 66.8% in 2015. In the same period, the activity rate of male rises too but of a lower amount than that of women and it is around 77.8%. If we look at single countries values, we observe for female activity rate a rise in almost all the European countries. With respect to men, the negative trend is widespread even if we observe a positive variation in Eastern and Central Europe. These data highlight cross-country differences in activity rates for both male and female. Also, the gender gap in participation rate shows a relevant difference across European countries: it decreased in almost all countries except in Estonia and Romania. Even for the gender gap, it is noted a difference between the Southern and CEE countries and the Northern and Western ones. The gender gap is still over 20% in Greece, Italy, and Malta and below 5% in Sweden, Finland, Lithuania, Latvia and Norway. Figure 2 shows four choropleth maps indicating the unemployment rates for the years 2004, 2007, 2011 and 2015 in Europe.

[1] Female activity rate is the percentage of active women in relation to the comparable total women population.

Figure 2: European countries' Unemployment Rates in 2004, 2007, 2011 and 2015

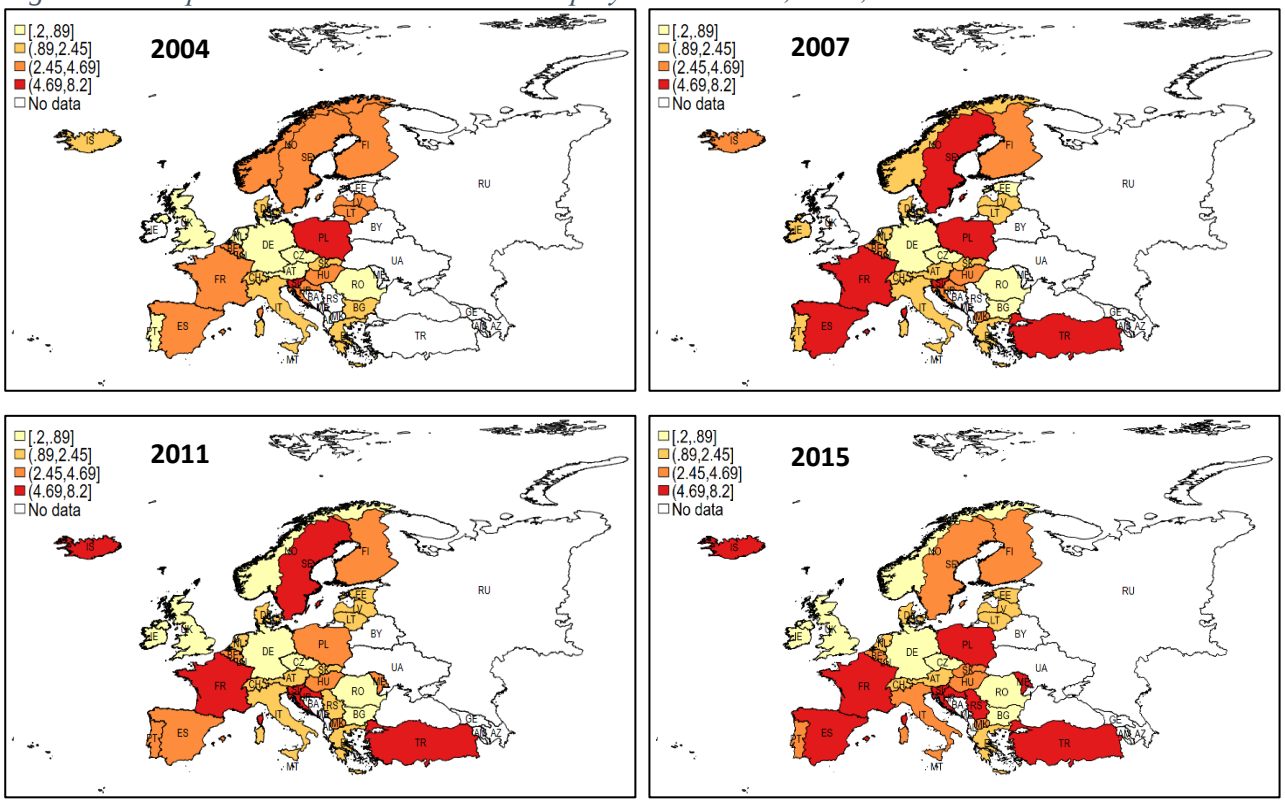


Source: authors' elaboration on EUROSTAT unemployment rate data
Note: for the class division we use the same quartile division of 2007 also for the other years

Unemployment has been rising sharply in the European countries since 2008. However, the onset of the increase as well as its severity varies widely between countries. In 2007, one year before the start of the Great Recession in Europe, the value of unemployment rate is below 10% in all the European countries. Considering instead 2011 (three years after the start of the crisis) the value of unemployment rate rises, especially in the Southern and CEE countries, overcoming the value of 15% in Greece, Lithuania, Latvia, and Serbia. In 2015, the situation is almost stable across European countries, even if we note for some of these a little decrease in term of unemployment rates, even though in Greece and Serbia remain above 17%.

Finally, in Figure 3 we report four choropleth maps indicating precarious employment for the years 2004, 2007, 2011 and 2015 in Europe.

Figure 3: European countries' Precarious Employment in 2004, 2007, 2011 and 2015



Source: authors' elaboration on EUROSTAT precarious employment data
Note: for the class division we use the same quartile division of 2015 also for the other years

Precarious employment (proxied by the fraction of employees with a short-term contract of up to 3 months) is more or less stable in Europe in the period 2004-2015. However, there are some countries departing from the general trend. We observe an increase of these values between 2010 and 2011 in Croatia (from 3.9 to 4.8), Belgium (from 2.6 to 3.2) and Portugal (from 1.1 to 3.6). From the graphs, instead, we note that the Scandinavian peninsula is characterized by a decreasing trend in terms of percentage of precarious workers starting from 2007 in Norway and from 2011 in Sweden and Finland. Countries like the Czech Republic and Bulgaria record the lowest values (<1.0) throughout the period 2004-2015. Conversely Poland, Slovenia, and Sweden record values > 4.0 for all the years observed.

1.7 Research Questions

The study considers the following questions in the analysis of the link between economic uncertainty and fertility. There is a close relationship between fertility and labour market participation of both members of couple, so a first research question is: *how and how much partners' main activity status and work characteristics influence fertility?*

However, the main activity status and work characteristics is not the only determinant explaining the couples' fertility in case of uncertainty, in fact in this context the amount of income

available by the family is also important: *does the family income variable mediates the association between partners' activity status and work characteristics and fertility?*

Furthermore, fertility occurs within relationships; thus, it is necessary also to account for the employment characteristics of both members of couple jointly. Partners can have different types of jobs and the possible combinations of these jobs can influence in different ways the childbearing decision, a third research question is: *what is the effect of the gender-specific combination of partners' activity status and work characteristics on fertility?*

Cross-country differences in reconciliation regimes can influence fertility. In fact, people may react differently to the same cause of uncertainty or certainty. In some countries it might be more difficult to combine work and family life and hence women's, in uncertainty situations, opt to work to contribute to family income, and to postpone childbearing. Since the relationship studied can depend on both welfare policies and partners' main activity status in a couple is reasonable to suppose that these two dimensions interact and that these combinations influence fertility. So, another research question is: *does the welfare and labour market regimes moderate the effect of partners' activity status and work characteristics on fertility?*

Despite the unfavourable economic conditions, couples continue to have children or in any case they would like to have them. In this context, the couple does not want to remain childless, but rather tend to limit the family size, this result in the postponement of first child rather than the foregoing of parenthood altogether. Since the social status of being parents is reached without having the second child, economic uncertainty may result in low second births rates. In this context the research question is: *on which transition (first or second child) the effect of the main activity status and work characteristics of the members of the couple is stronger?*

Moreover, research on the effect of economic recession on fertility usually supports the idea that fertility responds negatively to downturns in the business cycle. In other words, most studies find a pro-cyclical relationship between economic growth and fertility in the developed world (Sobotka, Skirbekk, Philipov 2011). Recessions often lead to a postponement of childbearing, especially of first births, which can later be largely compensated during times of economic prosperity (Neels 2010). So, a further research question can be: *does the Great Recession influence the couple dynamics leading to the birth of child?*

2 Data

In this chapter we first describe the dataset that we used for the subsequent analysis. In particular, we use the EU-SILC data, that permit to us to take into account in the models several demographic, economic and social variables. Then we report some descriptive statistics about the variables used in the case of conception of first and second child. These descriptive statistics are made in the final dataset where we have a couple-year in each row and show the distribution of the variables for women and men. Finally, to verify the validity of the data we make also an analysis of the sample attrition.

2.1 Data Presentation

For our analysis we use the longitudinal data of EU-SILC (European Statistics on Income and Living Condition), across the years 2004-2015. This survey started in 2003 with six countries, and now the dataset includes thirty-one nations. It offers information about individuals and households by collecting a wealth of economic, demographic, and social characteristics. The EU-SILC follows a rotational design, under which each year a new sample is drawn and followed for four years; moreover, each sample is representative of the whole population. The two main advantage of EU-SILC dataset are: its large country coverage, with a provision of harmonized socioeconomic measures of both individuals and household and the fact that the characteristics of both partners can be observed simultaneously. Because of children outside the household are not observed, birth events are underreported, and this may lead to downward bias in fertility analysis. So, the number of children can be underrepresented at all parities. A particular bias in the estimation of child order result for women over 40 years, this probably due to children who are unobserved because they have already left their parents' household. This problem is more serious in countries where children leave the parental home earlier than in countries where they leave later. Women who have had their children at relatively early ages are particularly at risk of an underestimation of their number of children at age 40. So, from that age on, birth orders are not attributed correctly, this results in an overestimation of children of birth order one and an underestimation of children of birth order two (Greulich and Dasré 2017). Another possible cause of underrepresentation of child births in EU-SILC dataset is the attrition. Attrition is potentially linked with fertility, as parents might decide to move when starting or enlarging family, which increase the risk of not being followed-up in the dataset. This risk is also present in case of household split (if a member leaves the household to live elsewhere) (Iacovou and Kaminska 2012). Adult children who leave their parents' household are thus those who may have a low follow-up rate. Moreover, these people are likely to have a first child, this is in line with the fact that, in EU-SILC database, for young women below the age of 30, children of order one are

underestimated (Greulich and Dasré 2017). Despite these drawbacks EU-SILC dataset covers a large set of countries and a relative long period, moreover, it provides comparable socio-economic information for all adult household members, so it can be used for modelling fertility without having highly biased estimates.

We build the pooled dataset by first combining all sub-datasets (individual and household) of each country from 2004 to 2015. We select individuals in couples where women are 15-49 years of age. In order to investigate the relation between the partners' labour market participation and the conception of the first child we select only childless couples that are followed for at least one year before the birth of the first child, so that we can use the covariates related to conception and not to birth.

We exclude data from Spain and Ireland because of nonresponse substitution for household that dropped out, which subsequently affected the sample representativeness (Iacovou et al. 2012). In addition, since we find unrealistically low numbers of births by exposure time in Cyprus, Malta, Romania and Luxemburg when compared with the period TFR, we also exclude these countries from the sample. So, excluding these six countries we obtain a dataset with 25 European countries[2], 55410 couple-waves and 4748 events, birth of the first child, with an overall first birth rate of about 0.086.

For our analysis we use a set of 13 different variables plus selected interactions between them. In order to study conception instead of birth, the variables refer to the year before the birth of the first child. For the discrete variables we consider an additional category referred to missing values (the category of missing values is considered in the model but is not shown in the table below).

The main activity status was our key explanatory variable; it was collected at the interview date and coded into five categories: workers with permanent contracts (1), workers with temporary contracts (2), self-employed (3), unemployed (4), not active (5) and other (student, retired, disabled and in military service) (6). We control for: women's and men's age at the beginning of the observation period (coded in classes: 1= up to 20, 2= 20-24, 3= 25-29, 4= 30-34, 5= 35-40, 6= 40 and over). The "partnership status" is reflected by an indicator measuring whether the person is married to, or living together with, a partner (coded 1 if married and 0 otherwise). The level of education and the equivalised income of both members of couple are other two control variables included in the model as they can influence the decision to have the first child. We created the following educational attainment groups (according with the International Standard Classification of Education): lower secondary school, primary school or lower education (1), upper secondary school or post-secondary

[2] Denmark, Finland, Sweden, Norway, Iceland, Austria, Belgium, France, Netherland, Switzerland, United Kingdom, Greece, Italy, Portugal, Bulgaria, Czech Republic, Estonia, Hungary, Croatia, Lithuania, Latvia, Poland, Slovenia, Slovakia, Serbia

non-tertiary education (2), and tertiary or higher education (3). The indicator used for individual income is the equivalised employee cash income. The term equivalised indicates that the employee cash income is divided by the number of household members converted into equalised adults; household members are equalised or made equivalent by weighting each of them according to their age, using the so-called modified OECD equivalence scale. The distribution of the resulting equivalised employee cash income is divided in terciles (low, medium, and high) per country. Moreover, we have inserted in the model two time scale: wave year (that is the number of years in which couple remain in observation) and calendar year (centred in 2008). We use 2008 as reference year because we are interested in studying the relation between Great Recession (started in 2008) and the conception of first child. For this purpose, we use also, a dummy variable (0 before 2008 and 1 after) to verify if there is a change in the event conception of the first child after the start of the Great Recession.

In addition, to account for the countries heterogeneity in Europe, we controlled our estimates for the geographic area of residence: North (Denmark, Finland, Norway, Sweden and Iceland), West (Austria, Belgium, France, Netherland, Switzerland and United Kingdom), South (Greece, Italy and Portugal) and East (Bulgaria, Czech Republic, Estonia, Croatia, Hungary, Lithuania, Poland, Slovenia, Slovakia, Latvia and Serbia). The macro-area of residence is the one where the couple leaves at the beginning of the interview period, because if the couple move to another countries this is no longer presents in the dataset.

2.2 Descriptive Statistics

In Table 1 we report the sample composition of the variables mentioned above:

Table 1: Distribution of observations by categories of each variables for conception of first child

		Freq.	Percent.
Activity Status Women	Work Permanent	26,326	47.51
	Work Temporary	4,845	8.74
	Self-Employed	3,680	6.64
	Unemployed	4,139	7.47
	Not Active	3,294	5.94
	Other	5,243	9.46
Activity Status Men	Work Permanent	28,949	52.25
	Work Temporary	3,500	6.32
	Self-Employed	6,751	12.18
	Unemployed	3,233	5.83
	Not Active	581	1.05
	Other	4,063	7.33

Table 1: (continued)

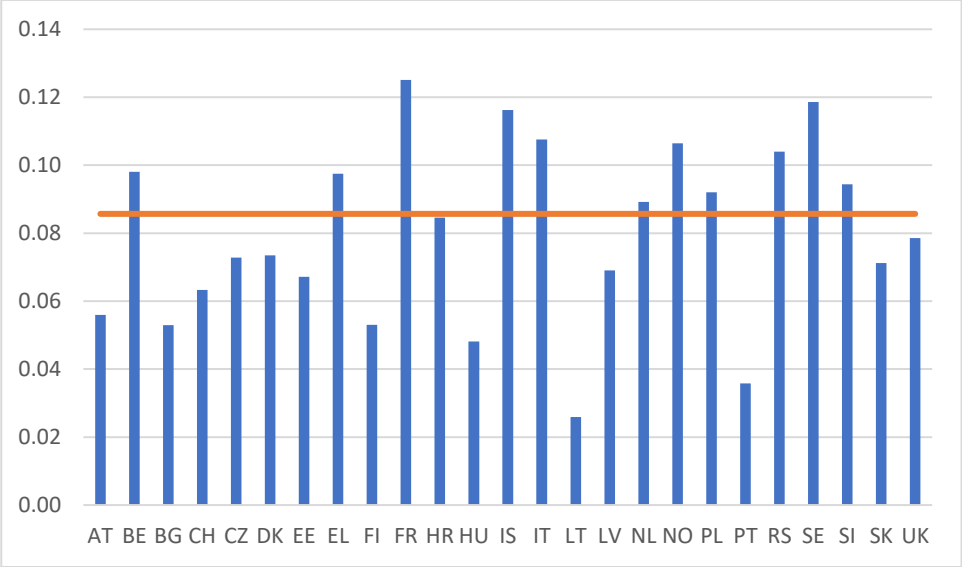
		Freq.	Percent.
Age of Women	15-25	8,784	15.85
	25-30	13,815	24.93
	30-35	8,931	16.12
	35-40	5,895	10.64
	40+	17,985	32.46
Age of Men	15-25	4,462	8.05
	25-30	11,761	21.23
	30-35	10,779	19.45
	35-40	6,889	12.43
	40+	21,519	38.84
Partnership Status	Married	29,326	52.93
	Cohabitation	25,973	46.87
Education Women	Low	7,647	13.83
	Medium	26,241	47.45
	High	20,279	36.67
Education Men	Low	8,907	16.07
	Medium	28,944	52.24
	High	16,327	29.47
Income Tercile Women	Low	19,070	34.42
	Medium	17,405	31.41
	High	17,321	31.26
Income Tercile Men	Low	18,539	33.46
	Medium	17,275	31.18
	High	16,950	30.59
Europe Area	Nordic	12,475	22.51
	Western	18,218	32.88
	Southern	9,103	16.43
	Eastern	15,614	28.18

Source: Authors' elaboration on EU-SILC data

The main independent variables are the one representing women's and men's main activity status. Table 1 show that, under a gender perspective, in our sample we have a higher proportion of women with a temporary job as compared to men (respectively, 8.74% versus 6.32%), while the self-employed status is more widespread among men than women (respectively, 12.18% versus 6.64%). Regarding the category unemployed, we note that this is more frequent among women, even if the differences is about two percentage points. The average age at the time of entry into the analysis (first wave) is about 34 for women and 37 for men.

In Figure 4 we report, for each country, the first birth rates considering the number of the couple-waves by country. Moreover, in the graph we report this rate calculated on the entire dataset (horizontal line).

Figure 4: First birth rates by country



Source: Authors elaboration on EU-SILC data

From the graph above we can note that most of the countries have a value that is below the value 0.086, calculated on the entire dataset. Lithuania and Portugal show the lowest value, around 0.02 and 0.04 respectively; conversely France shows the highest value (0.125).

For the analysis of the conception of the second child we use the same EU-SILC dataset as the case of the first child, across the years 2004-2015. Then, in order to investigate the relation between the partners' labour market participation and the conception of second child we select only couples who have one child and who are followed for at least one year before the birth of the second, so that we can use the covariates related to conception and not to birth. We obtain a dataset with 97978 couple-waves and 6187 events (birth of second child), with an overall second birth rate of about 0.063. For the analysis of the conception of second child we use the same 13 variables and interaction as in the case of first birth.

In Table 2 we report the sample composition of the variables mentioned above:

Table 2: Distribution of observations by categories of each variables for conception of second child

		Freq.	Percent.
Activity Status Women	Work Permanent	45,525	46.46
	Work Temporary	6,045	6.17
	Self-Employed	6,980	7.12
	Unemployed	7,708	7.87
	Not Active	16,736	17.08
	Other	3,460	3.53

Table 2: (continued)

		Freq.	Percent.
Activity Status Men	Work Permanent	54,520	55.65
	Work Temporary	5,534	5.65
	Self-Employed	14,433	14.73
	Unemployed	5,836	5.96
	Not Active	980	1.00
	Other	3,833	3.91
Age of Women	15-25	4,121	4.21
	25-30	13,192	13.46
	30-35	20,166	20.58
	35-40	17,433	17.79
	40+	43,066	43.95
Age of Men	15-25	1,513	1.54
	25-30	8,129	8.30
	30-35	17,755	18.12
	35-40	17,830	18.20
	40+	52,751	53.84
Partnership Status	Married	75,573	77.13
	Cohabitation	22,189	22.65
Education Women	Low	16,144	16.48
	Medium	51,015	52.07
	High	29,538	30.15
Education Men	Low	18,269	18.65
	Medium	55,467	56.61
	High	22,435	22.90
Income Tercile Women	Low	33,347	34.04
	Medium	30,262	30.89
	High	30,638	31.27
Income Tercile Men	Low	32,221	32.89
	Medium	30,148	30.77
	High	29,343	29.95
Europe Area	Nordic	14,495	14.79
	Western	21,530	21.97
	Southern	19,473	19.87
	Eastern	42,480	43.36

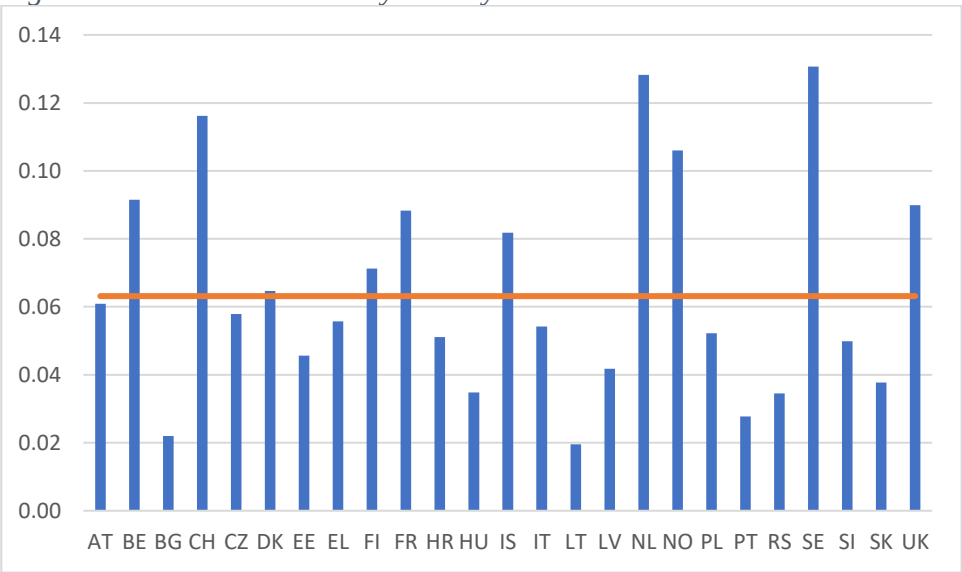
Source: Authors' elaboration on EU-SILC data

The main independent variables are the one representing women's and men's main activity status. Table 2 show that, considering the category not active, in our sample, we have a higher proportion of

women not active as compared to men (respectively, 17.08% versus 1%), while the self-employed status is more widespread among men than women (respectively, 14.73% versus 7.12%). The average age at the time of entry into the analysis (first wave) is about 38 for women and 41 for men.

In Figure 5 we report, for each country, the second birth rates considering the number of the couple-waves by country. Moreover, in the graph we report the rate calculated on the entire dataset (horizontal line).

Figure 5: Second birth rates by country



Source: Authors elaboration on EU-SILC data

From the graph above, about the second birth rates, we observe that most of the countries have a value that are below the 0.063 calculated on the entire dataset. Lithuania, Portugal, Serbia, and Bulgaria show the lowest value, around 0.02; conversely Switzerland, Netherland, Norway, and Sweden show the highest value around 0.12 that is about two-time higher as compared to the value calculated on the entire dataset.

2.3 Sample Attrition

Longitudinal dataset can have considerable advantages over more widely available cross-sectional data for social science analysis. In fact, these data permit: tracing the dynamics of behaviours; identifying the influence of past behaviours on current behaviours; and controlling for unobserved fixed characteristics in the investigation of the effect of time-varying exogenous variables on endogenous behaviours. However, a disturbing feature of such data is that there is often substantial attrition, and this may make the interpretation of estimates problematic. In fact, one of the factors that could weaken the validity of our dataset is related to the problem of the attrition. Attrition bias happen when people drop-out of the study before the end. This bias can deteriorate generalizability of

findings if the members who drop-out of a panel differ systematically from those who stay in it, then the dataset of continuing members is no longer representative of the original population (Fitzgerald, Gottschalk and Moffitt 1998). In general, the longer the follow-up period, the higher the chances are for drop-out. Attrition affects, in different way, most panel surveys but its consequences on model results are often not evaluated in demographic research.

In this study we also analyse the determinants of the attrition and the possible consequence for our results. The causes of drop-out that we can find in this research may be due to the inability to trace a couple that has moved both inside their residence country or to another country or even to the couple's refusal to participate in the survey again; so, generally at the unavailability of the couple. In order to consider the bias due to the attrition we make a hazard-based duration model. These types of models represent a class of analytical methods which are appropriate for modelling data that have as their focus an end-of-duration occurrence, given that the duration has lasted to some specified time (McCall 2005). In particular, we use a logistic hazard model, developed on couples-year and where the event of interest is the drop-out. This type of model is the same as we will use for the main analyses, except that the country effects, in this case, are fixed and not random. Moreover, in the model we consider a wide set of variables, because using as much information as possible about selection on observables in the data contributes to reduce the amount of residual and unexplained variation in the data due to attrition, and it is likely to reduce the biases due to the selection on observables (Alderman et al. 2001). The dependent variable of this model assume value 0 except in the year in which the drop-out occurs (if it occurs), where it assumes value 1. Although the rotation of the panel is not the same for all countries, we have chosen to use the minimum rotation (4 years) common to most countries, to make uniform the dataset. Moreover, cases in which couples left the analysis due to the women reaching the age of 50 or due to the fact that the country of residence was no longer observed in the following year were not considered cases of drop-out. Explanatory variables are all variables that are believed to affect the outcome variable of interest plus any available variables which characterise the interview process. In our case we use as covariates: the country of residence, women's and men's age at the first wave, partnership status, women's and men's educational level, activity status and income tercile. Table 3 below shows the percentage of couples who drop-out by country and wave in which they leave the analysis.

Table 3: Percentage of couples who drop-out by countries and wave

	Drop-out			
Country	**Wave 1**	**Wave 2**	**Wave 3**	**Total**
AT	29.33	14.79	9.49	53.60
BE	30.00	16.90	12.77	59.67
BG	13.79	15.09	9.47	38.35
CH	22.30	8.72	5.74	36.76
CZ	14.31	8.86	6.27	29.43
DK	19.88	19.15	14.02	53.05
EE	22.42	12.65	12.10	47.17
EL	17.34	11.69	10.17	39.20
FI	20.33	19.28	10.97	50.58
FR	23.05	12.49	8.56	44.11
HR	22.30	21.87	4.80	48.97
HU	23.11	15.23	11.54	49.87
IS	32.03	16.91	11.04	59.98
IT	19.82	17.09	16.42	53.33
LT	12.72	12.55	9.63	34.90
LV	21.66	14.03	11.70	47.39
NL	21.09	14.47	11.83	47.39
NO	26.90	15.15	11.84	53.90
PL	16.72	15.07	10.72	42.51
PT	18.62	19.59	12.69	50.89
RS	16.17	18.38	11.73	46.28
SE	28.60	18.72	13.25	60.57
SI	30.80	17.87	10.48	59.15
SK	10.59	11.78	10.65	33.02
UK	37.89	18.71	8.40	65.01

Source: Authors' elaboration on EU-SILC dataset

From Table 3 above we note that, in almost all the countries, the highest drop-out percentage is in the first wave. Moreover, looking at the total percentage of drop-out, we note that, many of the countries show a dropout rate that is around 50%. In general, the country with the lowest drop-out percentage is the Czech Republic (about 29%), while the country with the highest percentage is the United Kingdom (about 65%). Although the percentages of attrition are high, they are in line with values found in other studies on the analysis of data quality in the EU-SILC dataset (Greulich and Dasre 2017; Jenkins and Van Kerm 2017).

Table 4 below shows the results of the logistic regression for the probability of leaving the survey before the end of the rotational period (4 year).

Table 4: Coefficients of the models and average marginal effect on the hazard of leaving the survey before the end of the rotational period

	Coef.	SE	AME
Country			
AT	-0.872***	0.035	
BE	-0.76***	0.034	0.021
BG	-1.542***	0.041	-0.101
CH	-1.37***	0.049	-0.079
CZ	-1.87***	0.041	-0.137
DK	-1.123***	0.039	-0.042
EE	-1.325***	0.039	-0.072
EL	-1.273***	0.036	-0.065
FI	-1.267***	0.036	-0.064
FR	-1.735***	0.033	-0.123
HR	-0.799***	0.049	0.013
HU	-1.098***	0.034	-0.038
IS	-1.032***	0.046	-0.028
IT	-0.95***	0.029	-0.014
LT	-1.441***	0.050	-0.088
LV	-1.17***	0.039	-0.050
NL	-1.342***	0.036	-0.075
NO	-1.368***	0.037	-0.078
PL	-1.474***	0.034	-0.092
PT	-0.934***	0.042	-0.011
RS	-1.004***	0.053	-0.023
SE	-0.967***	0.037	-0.017
SI	-0.8***	0.035	0.013
SK	-1.736***	0.052	-0.123
UK	-0.573***	0.032	0.058
Women's Age			
15-25	0.195***	0.019	0.034
30-35	-0.129***	0.016	-0.020
35-40	-0.163***	0.021	-0.026
40+	-0.347***	0.022	-0.052
Men's Age			
15-25	0.178***	0.023	0.030
30-35	-0.078***	0.017	-0.012
35-40	-0.112***	0.020	-0.018
40+	-0.212***	0.023	-0.032
Partnership Status			
Cohabitation	0.318***	0.011	0.050
Women's Education			
medium	-0.068***	0.015	-0.011
high	-0.158***	0.018	-0.024
Men's Eductaion			
medium	-0.022	0.014	-0.003
high	-0.072***	0.018	-0.011

Table 4: (continued)

	Coef.	SE	AME
Work Temporary	0.006	0.020	0.001
Self-Employed	-0.043	0.030	-0.006
Unemployed	0.076***	0.021	0.012
Not Active	-0.042**	0.019	-0.006
Other	0.114***	0.024	0.018
Men's Activity Status			
Work Temporary	0.087***	0.021	0.013
Self-Employed	-0.028	0.024	-0.004
Unemployed	0.049**	0.022	0.007
Not Active	0.083*	0.047	0.013
Other	-0.002	0.025	-0.0004
Women's Income Tercile			
Medium	-0.041***	0.015	-0.006
High	-0.022	0.017	-0.003
Men's Income Tercile			
Medium	-0.119***	0.014	-0.018
High	-0.113***	0.015	-0.017

Source: Authors' elaboration on EU-SILC data
*Notes: * p≤0.1, ** 0.01<p≤0.05, *** p≤0.01; Models also include missing categories*

From the Table 4 above emerges that only men and women in the first category of age (15-25) present a positive coefficient, so people in the other categories are less likely to abandon the survey. For the partnership status emerges that cohabiting couples are more likely to drop-out. Moreover, both for men and women, the "unemployed" category presents a positive coefficient, so who is unemployed is more likely to leave the survey compared to those who have a permanent job. Instead, the category "not active" presents a negative value for women and a positive value for men; so, the not active women are less likely to leave the survey, while the not active men are more likely to drop-out. The income tercile and education of both partners appear to have negative coefficients for all categories, therefore a lower propensity to drop out. All the control factor inserted in the model seem to be correlated with sample attrition, so to take into account of this source of bias we insert all these variables also in the models for the conception of first and second child. However, there remains a potential bias due to unobserved variables that can systematically influence the follow-up, such as family/career orientations (more career-oriented women tend to have higher mobility and thus lower chances to participate to a follow-up).

3 Methods

In this chapter we first describe the theory of event history analysis that is the basis for the construction of our subsequent models. Then we introduce the multilevel discrete-time hazard models that permit us to take into account of the nested structure of the data and the heterogeneity between European countries. Through these models we try to answer to the research questions regarding the influence of main activity status and work characteristics on fertility and about the possible mediation of income variable on the link between activity status and fertility. Having the information of both partners, it is possible through the use of multilevel models to analyse if there is an effect of the gender-specific combination of partners' activity status on fertility and if the different welfare and labour market regimes moderate the effect of partners' activity status on fertility. In a second section of this chapter, we describe the methods that we use to verify the goodness of fit of the models describe in the first section. Finally, in the last part of this chapter we describe the theory of structural breaks that is used in this context to verify if the Great Recession influence fertility behaviour. In general, the analytical strategy of this study is to develop a model for each research question. Therefore, we get four different models using a hierarchical strategy, as we add a covariate or an interaction to each subsequent model. These models are characterized by an intercept and a random slope, the latter being used to model the heterogeneity between countries of the linear trend. Furthermore, the general effect of the square of the calendar year (curvature) and of the pre/post 2008 dummy (effect of the crisis) is also considered. Once these models have been estimated, an analysis of goodness-of-fit is carried out, not to decree the best model but to assess how well the models fit our data, since each model responds to a specific research question. Finally, through the analysis of structural breaks, the heterogeneity between countries of the pre/post dummy variable for each of the years in the period 2005-2015 is considered. Through this analysis it is possible to establish the presence of structural breaks, or changes in the parameters of the model between two period. In this way the influence of the Great Recession on fertility across European countries is assessed. Finally, we use the results of structural breaks analysis to refit the models, one for each macro-area of residence, inserting for each of these models the pre/post dummy on the year in which a structural break occurred. Through these further models it is possible to evaluate whether the influence of covariates on the dependent variable changes with respect to the general model. For a seek of transparency and replicability, the STATA code used for data preparation and analysis is reported in the Appendix (Table A1).

3.1 Model

To answer our research question, given the form of the data, we use event history analysis. In general, an event history is a record of when events occurred to a sample of individuals (Tuma and Hannan 1978). Since our goal is to study the conception of the child, in our dataset the sample consists of couples where women are in childbearing age; so, couples event history consist of the conception date of the first child in an initial step and of the second child in a second step, if any. Since we are interested in the causes of these events the event history analysis permits us to include data on relevant explanatory variables; some of these may be constant over time while others may vary. Most methods for analysing event histories assume that time is measured as a continuous variable (it can take on any nonnegative value). In some cases, however, discrete-time models and methods may be more appropriate or sometimes highly useful. In fact, in some situations, events can occur only at regular, discrete points in time; while in other, events can occur at any point in time, but available data record only particular interval of time in which each event occurs (Allison 2014). Discrete-time methods have several desirable features. It is easy to incorporate time-varying explanatory variables into a discrete-time analysis. Moreover, when the explanatory variables are categorical, discrete-time models can be estimated by using log-linear methods (Allison 1982). Given these desirable features, these models have been widely used from the researchers in the event history analysis (see for example Oppenehimer 2003; Brand and Davis 2011; Bratti and Tatsiramos 2012; Van Hook and Altman 2013; Barbieri et al. 2015; Inanc 2015). In our data, the record of event occurrence is made in discrete intervals because the data are record yearly. The finest scale that can be used with these data would be the four-month period since the month of birth is expressed in this unit. However, this scale would not be fine enough for a continuous time model. Furthermore, some of the variables of interest are collected annually. In addition, an analysis using four-month periods would entail a substantial increase of the computational burden due to the larger size of expanded dataset needed for estimating the discrete-time multilevel hazard model. In light of this, we use the annually information, so the dataset is defined by couple-waves year, obtained by expanding the dataset so that each couple has a record for each wave.

Even if event history analysis is a powerful analytical tool, it has some limitations, in particular the left censoring. In case of left censoring the individual history is only partially observed so that some events occurred before the start of the observation period (Hosmer, Lemeshow and May 2008). Fortunately, left censoring occurs much less frequently in practice than right censoring which is much easier to accommodate.

For our analysis we assume that individuals act independently, so it is likely that individuals in the same macro context have more similar behave respect to individuals from different context. Therefore, statistical procedures that do not consider the multilevel data structure underestimate standard errors (Kreft 1994; Muthén 1997). In this context multilevel models rather than traditional single-level techniques are more appropriated for our purpose (DiPrete and Forristal l994; Hox and Kreft 1994). Instead of there being simple, overall differences between groups, there may be important people-group interactions: contextual effects may not be the same for all types of people. Moreover, it allows, for example with random slopes, to consider the heterogeneity between countries (Duncan and Jones 2000). Multilevel models are, therefore, a means of investigating complex between-place and between people differences. They provide a way of explicitly modelling heterogeneity. We use, specifically, a multilevel discrete-time hazard model with random slope and intercept. A random slope model implies that each country has a different slope, to allow the explanatory variable (in this case calendar year) to have a different effect for each country.

The multilevel data structure requires couples to be followed for several years and grouped into countries (*k*). The couple's home country is the one recorded in the first interview wave, since if the couple changes their country, this is no longer observed. We assume that couples that are no longer observed due to the change of the residence country are few and therefore do not cause problems in the analysis. In the data are present couple that are right censored, that is when an event time is unknown because event occurrence is not observed. In our case the censure occurs both because the couple has finished the observation period and therefore leaves the analysis or because between one wave and another the couple is no longer detectable. We assume that this right censure is not informative (conditional on the explanatory variables included in the models), that is when the couple who drop-out of the study should do so due to reasons unrelated to the study (couple has a censoring time that is statistically independent of their event occurrence time). The response variable is (T_{ik}, R_{ik}) that denote, if the event occurs for a couple *i* in a country *k*, the time when it occurs (T_{ik}) and if the couple is censored (R_{ik}). The response variable is defined also if the couple is right censored, in this case the variable assumes the maximum value, that is the last time the couple is observed. After defining the response variable, we can also define the hazard function as follows. Let be T_{ik} the discrete random variable denoting the time of event occurrence and denote the hazard rate by $h_{ik}(t)$. Then:

$$h_{ik}(t) = Pr\{T_{ik} = t | \, T_{ik} \geq \, t, u_{0k}, u_{1k}\} \qquad [1]$$

that is, the probability of the event occurring during the year *t*, on the condition that it did not occur beforehand (Singer and Willet, 1993). Specifically, $h_{ik}(t)$ is the hazard of the "success" of an event for couple *i*, and country *k* in year *t*. Then it is necessary to specify how the hazard rate depends on time and the explanatory variables, we use the logistic regression function (Cox 1972). The logistic regression model constrains $h_{ik}(t)$ to lie in the unit interval for any values of coefficients and covariates; furthermore, it implies that there are sufficient statistics.

Considering the hazard rate defined in equation [1] and the covariates of interest described in chapter 2 we can defined the following model equation:

$$logit(h_{ik}(t)) = \alpha_t + (\gamma + u_{1k})c_t + \eta c_t^2 + \theta d_{t(2008)} + \boldsymbol{\beta x}_{ikt} + \boldsymbol{\delta w}_k + u_{0k} \quad [2]$$

In this model α_t represent the intercept of year *t*, c_t is the variable calendar year centred on 2008 inserted in the model also squared and as random slope. In this model we have chosen to model only the heterogeneity between countries of the linear trend and not of the quadratic one (the curvature). $d_{t(2008)}$ is the dummy variable post-2008 (here the dummy captures the general effect of the crisis while the between countries heterogeneity of this effect will be checked with the analysis of structural breaks), $\boldsymbol{x}_{ikt}$ is a vector with the micro-level covariates and $\boldsymbol{w}_k$ is a vector of dummy variables for the macro-area of residence. The last part of the model is composed of the random effects at country level. The random effects u_{0k} and u_{1k} follow a bivariate normal distribution which can be expressed as:

$$\begin{pmatrix} \boldsymbol{u}_{0k} \\ \boldsymbol{u}_{1k} \end{pmatrix} = MVN(\mathbf{0}, \boldsymbol{\Omega_u}) \quad [3]$$

where $\mathbf{0}$ denotes a vector of two zeros and $\boldsymbol{\Omega}_u$ is the covariance matrix of the random effects. Estimators for the parameters of the discrete-time hazard model and therefore of the $h_{ik}(t)$, can be obtained by the method of maximum likelihood. The likelihood function is composed by the product of two parts, one relative to the uncensored couples and the second relative to the censored ones. A couple that is not censored ($R_{ik} = 0$) experiences the event in time period *t*. A censored couple ($R_{ik} = 1$), instead, does not experience the event in any period *t* in which it is observed.

$$L = \prod_{k=1}^{K} \int \prod_{i=1}^{n_k} [\Pr(T_{ik} = t | u_{0k}, u_{1k})]^{1-r_{ik}} [\Pr(T_{ik} > t | u_{0k}, u_{1k})]^{r_{ik}} \phi(u_{0k}, u_{1k}; \mathbf{0}, \boldsymbol{\Omega}_u) du_{0k}, u_{1k} \quad [4]$$

Each of the two probabilities can be expressed in term of hazard rate:

$$\Pr(T_{ik} = t_{ik} | \, u_{0k}, u_{1k}) = h_{ikt_{ik}} \prod_{t=1}^{t_{ik}-1} (1 - h_{ikt}) \quad [5]$$

$$\Pr(T_{ik} > t_{ik} | \, u_{0k}, u_{1k}) = \prod_{t=1}^{t_{ik}} (1 - h_{ikt}) \quad [6]$$

Substituting in the likelihood formula and taking the logarithm we obtain:

$$l = \sum_{k=1}^{K} log \int \left\{ \prod_{i=1}^{n_k} \left[h_{ikt_{ik}} \prod_{t=1}^{t_{ik}-1} (1 - h_{ikt}) \right]^{1-r_{ik}} \left[\prod_{t=1}^{t_{ik}} (1 - h_{ikt}) \right]^{r_{ik}} \right\} \phi(u_{0k}, u_{1k}; \mathbf{0}, \mathbf{\Omega}_u) du_{0k}, u_{1k} \quad [7]$$

The dependent variable is expressed as a vector of binary variables, in order to be able to use the estimation algorithms of binary response models. Therefore, it controls the occurrence or non-occurrence of the event, its value is 0, if the event of interest did not occur, and 1, if it did. At this point, in order to use estimation methods for binary response models, we can introduce the event-history indicator y_{ikt}. If couple *i* in country *k* is not censored, the target event occurs in time period *t*; thus all y_{ikt} are equal to zero except at time *t* where is equal to one. If couple *i* in country *k is* censored, the target event does not occur in any period so all the event-history indicators y_{ikt} are zero. Using these dummy indicators, and after some mathematical adjustment, we can rewrite the log-likelihood as follow:

$$l = \sum_{k=1}^{K} log \int \left[\prod_{i=1}^{n_k} \prod_{t=1}^{t_{ik}} h_{ikt}{}^{y_{ikt}} (1 - h_{ikt})^{(1-y_{ikt})} \right] \phi(u_{0k}, u_{1k}; \mathbf{0}, \mathbf{\Omega}_u) du_{0k}, u_{1k} \quad [8]$$

The last formula is the log-likelihood function for the discrete-time hazard process in terms of the data (y_{ikt}) and the hazard probability parameters (h_{ikt}) (Singer and Willet 1993). Any program for maximum-likelihood estimation in a multi-level regression analysis of a dichotomous dependent variable can be used to estimate the regression coefficients (Barber et al. 2000). In our case the command used (*meqrlogit*) on Stata 15 provides an estimation method, which uses the QR decomposition of the variance-components matrix. This method may aid convergence when variance components are near the boundary of the parameter space. In general, log-likelihood calculations for fitting any multilevel model requires integrating out the random effects. For Generalized Linear Mixed-Effects (GLME) models the integral in equation [8] to calculate the likelihood cannot be

evaluated analytically. One way to proceed is to use numerical integration, which essentially replaces the integration with a summation. This involves approximating the normal distribution for the random effects by a discrete distribution with *q* quadrature points. The estimation method used by *meqrlogit* is a multi-coefficient and multilevel extension of Adaptive Gaussian Quadrature (AGQ) based on conditional modes (Pinheiro and Bates 1995; Pinheiro and Chao 2006).

The use of a multilevel hazard model gives valuable insights in the phenomenon under study as it allows us to verify whether differences in outcomes reflect differences in the effects of country-specific characteristics rather than differences in outcomes associated with changing characteristics of individuals themselves. Some problems may arise, however, from using multilevel models when the number of countries in a multi-country dataset is small. In fact, the derivation of model parameter estimates with desirable proprieties is contingent on sample size being sufficiently large. If the number of groups is small estimates of the variance components and of their standard errors are imprecise and likely to be biased downwards. Estimates of the standard errors of fixed parameters are also affected by the uncertainty in the variance estimates and so they are biased downwards. So, if the number of countries is small, estimates of country effects produced may be unreliable (Bryan and Jenkins 2015). Most multilevel modelling textbooks mention this problem and sometimes cites the rules of thumb, recommending anywhere between 10 and 50 groups as a minimum. The minimum number depend on application-specific factors like the number of group-level predictors (Raudenbush and Bryk 2002) and whether the interest is focussed on the coefficient of the fixed or the parameters of the random part (Hox 2010). Another rule of thumb for multilevel linear models, based on simulation evidence, states that 10 groups are sufficient for unbiased estimates of the coefficients, at least 30 groups are needed for good variance estimates and at least 50 for good standard errors estimates, in particular for those associated with variance component (Maas and Hox 2004). Even if there is less evidence for multilevel logit models, the existing studies suggest broadly similar conclusions, although for the same precision a higher number of groups is needed, and this number still increases for the models with random slope (Austin 2010; Stegmueller 2013). In general, with a small number of groups, estimates of fixed effect parameters in binary logit models are unbiased, even if not always for the level-2 coefficients (Moineddin, Matheson and Glazier 2007; Paccagnella 2011). The magnitude of the downwards bias of the variance components depend also on the type of estimator used to maximize the likelihood (adaptive quadrature provides better estimates) and on the fact that the standard errors associated with fixed and variance parameters are too small. Bryan and Jenkins (2015) use Monte Carlo simulations to assess how large the number of countries needs to be to derive accurate estimates of model parameters and their standard errors from the standard

multilevel model estimators. Their analysis shows that users require 25 countries for linear models and 30 for logit models (the number of countries increases with the complexity of the model). The authors used as reference points a relative bias of 0 per cent and a non-coverage rate of 0.05, but fewer countries might be sufficient if one is content to be fairly close to these values. For a multilevel logit model, if one tolerates a non-coverage rate of 0.08, 20 countries are sufficient, even if for models with random slope it may take more countries to obtain the same non-coverage rate (for example see Bryan and Jenkins Supplementary Material 2015). For our analysis we have 25 countries available so, in light of what has been said so far, we can assume that the distortion deriving from the use of this number of groups is quite small and therefore the estimates obtained from the models can be considered sufficiently reliable.

In the tables of results we will display the coefficients of the models and average marginal effects, that is the sample mean of the marginal effects for a couple belonging to a mean country ($u_{0k} = 0$, $u_{1k} = 0$). Since our variables are categorical the average marginal effects that we obtain are discrete change and not derivatives. Furthermore, this model is a model for the hazard, but it is estimated as logit model on the couple-year dataset, so the couples that remain for several years in observation contribute more on the average marginal effect.

3.2 Goodness of fit

In general, after the choice regarding the specification of the model to be used, the statistical model requires validation, that is demonstration that the model make good prediction in other sample than the one in which it was derived. One type of internal validation is the one that divide the data set randomly in two portions, one for model development and the other for model validation. When validating logistic regression, the focus is to know if the predicted probabilities agree with the responses within the sample. A goodness-of-fit statistic provides a summary measure of the deviation of predicted probabilities from the observed outcomes (Miller and Hui 1991). This deviation can come from two main type of sources. The first arise if on average predicted probability of success in the validation set is too high or too low. This component of predictive accuracy is called calibration. In clinical epidemiology, calibration refers to a property of a risk score or other numerical predicted rule. One methodological publication that is often cited for calibration index (calibration slope and calibration-in-the-large) is 1958 paper by Cox that describe the use of intercept and slope of a logistic regression to evaluate agreement between an observed binary sequence and a corresponding sequence of probabilities (in this paper it used the term “spread” instead of “calibration”). A second source of deviation reflects a model’s discrimination and concerns how well the model can discriminate between success and failure outcomes. So, it is important to verify what is the discriminatory ability

in the validation sample. This component of total deviation has been referred to concordance index (c-index) or area under the curve (ROC).

Calibration can be well assessed graphically with a calibration plot (Berger and Schmid 2018). To obtain the graphs, first it divides the couples of the sample in two subgroups, that are the development and the validation group. The model is fit only on the development sample, then it uses the results obtained to predict the hazard in the validation subgroup. The graphs report, for the validation sample, the mean of the expected hazard versus the sample proportion of conception in each group identified by the deciles of the distribution of the predicted hazard (10 groups by default). In general, the closer the observations are to the bisector, the better is the model fit. This graph can be associated to a graphical representation of the Hosmer-Lemeshow goodness-of-fit test (Steyerberg and Vergouwe 2014). It is possible to assess the overall fit of the model with a Pearson chi-square statistic:

$$\chi^2 = \sum_{g=1}^{G} \frac{(O_g - E_g)^2}{N_g \pi_g (1 - \pi_g)} \qquad [9]$$

where O_g represent the observed events, E_g the expected events, N_g the total observation and π_g the predicted probabilities in the gth group. The test statistic asymptotically follows a χ^2 distribution with *G-2* degrees of freedom (Lemeshow and Hosmer 1982; Hosmer and Lemeshow 1989). The graph also shows the expected/observed ratio, that is the ratio between the total expected couples that experiencing the event (conception of child) and the total observed of couples experiencing the event, thus an ideal value is 1.

To verify the goodness-of-fit of the models it is possible to use both calibration and discrimination indices. As calibration index it is possible to report the calibration slope, that is one measure of agreement between observed and predicted risk of the event (outcome) across the whole range of predicted values; it should ideally be 1. For logistic regression (as in our study) we can write the recalibration model:

$$logit(Y_{validation}) = \alpha + \beta_{overall}(lp) \qquad [10]$$

where

$$lp = logit(\hat{Y}_{validation}) = \boldsymbol{x}^T \boldsymbol{\beta} \qquad [11]$$

the linear predictor (*lp*) is the combination of regression coefficients deriving from the model carried out in the development sample ($\boldsymbol{\beta}$) and the prediction values in the validation sample ($\boldsymbol{x}$). The $\beta_{overall}$ is named calibration slope (Steyerberg 2009). The calibration slope can be used as a statistic for evaluating to which extent the model's predictive mechanisms remain valid in the validation sample. Another index that is reported jointly to the calibration slope is the calibration-in-the-large (CITL), whose coefficient evaluates whether there is a difference between the sample proportion of conceptions and the average predicted hazard (0 for good calibration) and is estimated as the intercept of the recalibration model, while the calibration slope is fixed at a value of 1.

$$logit(Y_{validation}) = \alpha + offset(lp) \quad [12]$$

The intercept α reflects the difference in *logodds* between predictions and observed outcome, adjusted for the linear predictor that is the offset (Steyerberg 2009). The deviation of the calibration slope and calibration-in-the-large from the ideal values (1 and 0 respectively) can be tested by a Wald test (Cox 1958).

The measurement of discrimination is a difficult task than the measurement of calibration because the ability of a model to spread the probability estimates depends on the sample. So, a good measure of discrimination should it describe the discriminatory ability of the predictor in relation to the outcomes, it should also be little affected by the underlying range of probabilities. A traditional measure of discrimination is c-index (concordance index) that measure the prediction model's discrimination (separation) between those with or without the outcome (Harrell et al. 1982). It gives the probability that for any randomly selected pair of individuals, one who experiences the event and one who does not, the model assigns a higher probability to the individual who experiences the event (conception of child). A value of 1 indicates that the model has perfect discrimination, while a value of 0.5 indicates the model discriminates no better than chance (Debray et al. 2015).

The goodness-of-fit indices described above have developed and applied mainly in biostatistical and especially in medical field, as a response to the need to validate statistical models developed for prediction. In general, the use of logistic regression models in medicine is extremely widespread, because in most application, the outcome of interest is binary, and the information can be expressed as probabilistic predictions (Lee et al. 1995, Harrell 2015). For example, they are employed in stratifying analysis, as benchmarks for quality-of-care assessment, in the definition of eligibility criteria for clinical trials, to evaluate risk factors, to make prediction of the presence of disease (diagnosis) or an event in the future course of disease (prognosis) (Steyerberg et al. 2010).

These logistic regressions should be able to both, discern individuals with different outcomes and produce reliably estimate event rates. These two properties are respectively known as discrimination and calibration. When the good calibration is internally assessed, that is in the same sample used to estimate the prediction is often referred to as goodness-of-fit (Nattino, Finatti and Bertolini 2015). Despite the possibility of using the measures of calibration and "refinement" to assess the performance of regression model in presence of binary or survival outcome, these types of indices are not usually used outside the biostatistical field. Since in the development of the model the validation phase is of considerable importance, we propose to use the calibration slope, CITL, c-index and expected/observed ratio to verify the goodness-of-fit also in our study about the conception of first and second child. The use of these indices jointly to the graph representation permit us to condense the agreement of observed and fitted values into a single number or plot.

3.3 Structural Breaks

In specifying regression model, it is assumed that its assumption applies to all the observation in the sample. However, it is important to test the hypothesis that some or all the regression coefficients are different in different subsets of the data. In econometrics one of the most common test to verify if there are change in parameters of the model is structural break test. It is said that there is a structural break when a time series abruptly changes at a point in time. So, being able to detect when the structure of the time series changes can give us insights into the problem we are studying. In econometrics most of the results for structural change focus on time series where, differently to panel data, time (T) is large and the number of individual (N) is one. In addition, this literature focuses almost entirely on linear regression models (Zivot and Andrews 1992; Hansen 1992; Andrews 1993).

The test for structural change is typically attributed to Chow (1960). The test determines whether a single regression is more efficient than two separate regressions involving splitting the data into two subperiod, estimates the parameters for each subperiod, and then tests the equality of the two sets of parameters using a classic F statistic. This type of test can be seen as a special case of the more general likelihood ratio test (Dufour 1982). In fact, to obtain a likelihood ratio Chow test it is possible to fit the model for each break-date separately and then comparing the combined result with those of the complete model (model not split). Because the complete model included dummies for the different break-date, this version of the Chow test allows the intercept of the regression model to vary between the regimes. A limitation of the Chow test is that the break-date must be known a priori. To avoid this limitation, if the break-date is unknow, it is possible to pick an arbitrary candidate break-date or to pick a break-date based on some known feature of the data (Hansen 2001). The Chow test is usually applied in linear regression model but there is an analogous of this test for logistic regression, outlined

by Allison (1999). Considering the Chow test as a special case of likelihood ratio test it is possible to obtain the same test in logistic model applying the likelihood-ratio test for the complete model against the model with all the interaction between the dummy break-date variable and the other variables.

In our case, it is useful to apply the econometric theory of structural break to tests when and whether there is a significant change in our data; in particular help us to determine if the start of the Great Recession changes somehow the couples' decision to have a child. To verify the presence of structural break in the analysis due to the Great Recession, and to consider the different reaction of countries to the crisis, we divide the dataset in four subgroups (one for each macro-area) and repeat the tests in each of these subsets. We use fixed effects model instead random effects because dividing for each macro-area the countries in each subgroup are too few. So, to perform the extension of the Chow test we use the following model:

$$logit\big(h_{ik}(t)\big) = \alpha_t + \gamma c_t + \eta c_t^2 + \boldsymbol{\beta x}_{ikt} + \boldsymbol{\varphi w}_k + \theta d_t \qquad [13]$$

where α_t is the intercept of year *t*, c_t is the variable calendar year centred on 2008 and c_t^2 is its square, $\boldsymbol{x}_{ikt}$ is a vector with the micro-level covariates, $\boldsymbol{w}_k$ is a vector of country *k* and d_t is the dummy variable indicating the year that we are testing (0 before that year and 1 after).

Then we define the expanded version with interaction between all covariates and the dummy of the year as follows:

$$logit\big(h_{ik}(t)\big) = \alpha_t + \gamma c_t + \eta c_t^2 + \theta d_t + \boldsymbol{\beta x}_{ikt} + \boldsymbol{\varphi w}_k + \vartheta c_t d_t + \lambda c_t^2 d_t + \boldsymbol{\delta x}_{ikt} d_t + \boldsymbol{\varphi w}_k d_t \qquad [14]$$

The Chow test analogous for logistic regression using the two models above is then:

$$\chi^2 = -2(lnL_b - lnL_e) \qquad [15]$$

where lnL_b is the fitted log-likelihood for the basic model and lnL_e the fitted log-likelihood for the expanded model. Under the null hypothesis that regressor effects are the same across groups, χ^2 has a chi-squared distribution with degrees of freedom equal to the difference in the number of parameters estimated in the basic versus expanded model.

4 Employment Uncertainty and the First Child

In this chapter we start we a brief introduction regarding the decreasing trend of fertility and the link of this trend with employment uncertainty (used as proxy of economic uncertainty), focusing on the conception of the first child. In the second section of this chapter, we report the results of the models that answer the research questions presented in the section 1.7. In particular, with the first model we try to answer at the question regarding the influence of the main activity status and work characteristics on fertility. To verify if the income variable mediates the association between activity status and fertility, we add in the second model a covariates link to income tercile. Then in a third model we investigate the research question regarding the possible effect of the gender-specific combination of partners' activity status on fertility. Finally, in the fourth model we answer at the question regarding the fact that the welfare and labour market regimes moderate the effect of partners' activity status on fertility. After presenting the results of the models, in this section, tests are also reported to assert the goodness of fit of these models. In the third section of this chapter, we present the results of the structural break analysis to verify if the Great Recession influence the couple dynamics leading to the birth of first child. Then in light of the results of the structural breaks analysis we reproduce the first two models viewed in the second section for each macro-area of residence.

4.1 Introduction

In the recent decades Europe has been characterized by a decrease in TFR reaching, in most countries, sub-replacement levels. The permanence of the fertility values below the replacement level can have a negative impact on the macroeconomic equilibrium of a country, so it is important to understand what mechanisms lie behind low fertility. Often the increase in women labour force participation is associated with the decline in fertility (Cigno 1991; Becker 1981). The raise in female labour market participation should, on the one end, encourage the demand for children (income effect) but on the other, should increase the opportunity cost of childbearing (substitution effect) (Adserà 2004). Even if, in the last decades, labour market institutions have been revised in countries to make it easier to women to conciliate career and family, causing a change in the relationship between labour market outcomes and fertility at the macro level. The increasing competition in the labour markets and employers' rise demands for work flexibility have further discouraged childbearing (Mills and Blossfeld 2005). Job precariousness and employment instability in general, have increase uncertainty; so, the couples, before deciding to start a family, try to strengthen their economic position (McDonald 2006). To analyse the link between fertility and economic uncertainty it is necessary to consider the features of both partners to verify how much and how the combinations of the characteristics of men

and women in a couple influence the decision to start a family. This study focused on Europe during the years 2004-2015; so, the period includes the recent economic recession started in 2008. Using EU-SILC data we investigate the relation between work uncertainty and conception of first child. Often, only unemployment status is used as proxy of job uncertainty, but also the new types of job contracts (temporary contracts, flexible job, temporary contracts) are important source of uncertainty. Overall, unemployment and temporary contracts (instead permanent one) involve work uncertainty that tend to inhibit family formation (Kohler and Kohler 2002; Blossfeld et al. 2005; Scherer 2009). We analyse how the main activity status of both women and men influence fertility controlling for other characteristics (income, age, union, and level of education). Then we verify if different combinations of the two main activity status affect conception of first child differently. Finally, since the period available covers the Great Recession, the structural break theory is used to check if the time series abruptly changes between the period before and after the onset of the crisis.

4.2 Results

We apply the model [2] outlined in section 3.1. To select the covariates and specify their effect we proceed in a stepwise way. These model specifications allow us to isolate the association of a specific variable on the hazard of having the first child and to answer our research questions. Moreover, each model specification, trying to answer the research hypothesis, it is developed in function to each of these. In the first specification (Model 1) we include the key covariates, main activity status and work characteristics of both partners, and all the control variables at the individual level, except the men's and women's income terciles, which are inserted in the second model specification (Model 2). So, with Model 1 we evaluate if partners' main activity status influence fertility, while with Model 2 we analyse if the family income variable mediates the association between partners' activity status and couples' fertility. In the third specification (Models 3), we add the interaction between the women's and men's main activity status, in order to verify if the interaction between different welfare regimes and activity status of both member of a couple influence fertility. Finally, in the fourth model specification (Model 4), in addition to the key and control variables at the individual level, we insert the macro-area of residence and its interaction with the main activity status of both partners. With this last model we evaluate if the interaction between different welfare regimes and activity status of both member of a couple influence fertility. For the household composition, the reference category is that of married couple; for education is low level; for the activity status is that of permanent workers; and for income tercile is the low tercile. For the areas of residence, the reference category is Northern countries. An important way to examine the effects of a variable is to compute how changes in the variable are associated with changes in the outcomes, holding other variables constant. These

changes, known as marginal effects, can be computed as a marginal change when a regressor changes by an infinitely small amount or as a discrete change when a regressor changes by a fixed amount (Long and Freeser 2006). Below, in addition to the table reporting the coefficients and the average marginal effects (AME) of all the covariates, there is also a graph showing the AMEs values for the covariates main activity status and income tercile of both partners in the four models. The average marginal effect corresponds to the derivative in the case of quantitative variables and to the discrete variation in the case of categorical variables, that is our case (Williams 2012). Specifically, for discrete variables the AME (multiplied by 100) can be interpreted as the percentage increase/decrease of the hazard due to that category compared to the reference category. On the other hand, in the case of a continuous variable the AME refers to the average percentage increase/decrease on the hazard as the covariate increases by one unit. Moreover, Figure A1 to A4Figure A4 in the appendix show the graphs for the AMEs coefficients for all the covariates separately for each model.

Table 5:Coefficients of the models and average marginal effect on the hazard for the conception of the first child, 2004-2015

	Model 1			Model 2			Model 3			Model 4		
	Coef.	**SE**	**AME**	**Coef.**	**SE**	**AME**	**Coef.**	**SE**	**AME**	**Coef.**	**SE**	**AME**
Wave (ref=1)												
1	-1.301***	0.124		-1.598***	0.130		-1.661***	0.129		-1.173***	0.263	
2	-1.497***	0.125	-0.014	-1.813***	0.132	-0.015	-1.875***	0.131	-0.015	-1.389***	0.264	-0.016
3	-2.218***	0.134	-0.051	-2.542***	0.141	-0.052	-2.601***	0.140	-0.052	-2.111***	0.268	-0.053
4	-1.91***	0.169	-0.038	-2.247***	0.174	-0.040	-2.309***	0.174	-0.040	-1.85***	0.286	-0.042
Post-2008	-0.119	0.080	-0.008	-0.134*	0.080	-0.009	-0.133*	0.080	-0.009	-0.126	0.080	-0.009
Women's Age (ref=25-30)												
15-25	0.003	0.050	0.000	0.043	0.050	0.004	0.042	0.050	0.004	0.04	0.051	0.004
30-35	-0.009	0.044	-0.001	-0.037	0.044	-0.003	-0.038	0.044	-0.004	-0.036	0.044	-0.003
35-40	-0.659***	0.071	-0.049	-0.694***	0.071	-0.051	-0.698***	0.071	-0.052	-0.694***	0.071	-0.052
40+	-3.17***	0.136	-0.105	-3.209***	0.136	-0.106	-3.216***	0.136	-0.107	-3.215***	0.136	-0.108
Men's Age (ref=25-30)												
15-25	-0.244***	0.067	-0.016	-0.207***	0.067	-0.014	-0.199***	0.068	-0.014	-0.196***	0.068	-0.014
30-35	0.053	0.042	0.004	0.029	0.043	0.002	0.031	0.043	0.002	0.038	0.043	0.003
35-40	-0.157***	0.059	-0.011	-0.181***	0.059	-0.013	-0.18***	0.059	-0.012	-0.175***	0.059	-0.012
40+	-0.703***	0.080	-0.040	-0.714***	0.080	-0.041	-0.712***	0.080	-0.041	-0.704***	0.081	-0.041
Partnership Status (ref=married)												
Cohabitation	-0.625***	0.037	-0.043	-0.629***	0.037	-0.043	-0.63***	0.037	-0.044	-0.641***	0.037	-0.045
Women's Education (ref=low)												
Medium	0.099	0.065	0.006	0.067	0.065	0.004	0.074	0.065	0.005	0.073	0.066	0.005
High	0.34***	0.069	0.022	0.272***	0.070	0.018	0.276***	0.070	0.018	0.275***	0.070	0.019
Men's Education (ref=low)												
Medium	0.05	0.055	0.003	0.025	0.055	0.002	0.028	0.055	0.002	0.031	0.055	0.002
High	0.056	0.060	0.004	-0.007	0.061	0.000	-0.002	0.061	0.000	0.0002	0.062	0.000

Table 5: (continued)

	Model 1			Model 2			Model 3			Model 4		
	Coef.	**SE**	**AME**	**Coef.**	**SE**	**AME**	**Coef.**	**SE**	**AME**	**Coef.**	**SE**	**AME**
Women's Activity Status (ref=work permanent)												
Work Temporary	-0.23***	0.055	-0.016	-0.173***	0.056	-0.012	-0.12	0.080	-0.011	-0.029	0.219	-0.009
Self-Employed	-0.249***	0.076	-0.017	-0.025	0.087	-0.002	0.065	0.119	-0.002	-0.27	0.264	-0.007
Unemployed	-0.226***	0.066	-0.016	-0.055	0.072	-0.004	-0.061	0.096	-0.006	-0.443*	0.250	-0.008
Not Active	-0.128	0.083	-0.009	0.064	0.089	0.005	0.119	0.116	0.002	-0.889*	0.483	-0.012
Other	-0.877***	0.076	-0.048	-0.683***	0.083	-0.038	-0.582***	0.118	-0.037	-0.718***	0.213	-0.041
Men's Activity Status (ref=work permanent)												
Work Temporary	0.009	0.061	0.001	0.071	0.062	0.005	0.2**	0.099	0.007	-0.21	0.264	0.003
Self-Employed	-0.033	0.055	-0.002	0.126*	0.066	0.009	0.185**	0.089	0.009	-0.302	0.207	0.005
Unemployed	-0.28***	0.084	-0.017	-0.137	0.087	-0.009	0.063	0.129	-0.009	-0.375	0.297	-0.014
Not Active	-0.211	0.187	-0.014	-0.06	0.189	-0.004	-0.399	0.357	-0.008	-3.047***	1.152	-0.013
Other	-0.447***	0.096	-0.026	-0.267***	0.100	-0.016	0.016	0.162	-0.011	-0.02	0.248	-0.021
Calendar Year (centered on 2008)	0.053**	0.021		0.048**	0.021		0.048**	0.021		0.046**	0.021	
Squared Calendar Year (centered on 2008)	-0.012***	0.003		-0.012***	0.003		-0.011***	0.003		-0.011***	0.003	
Women's Income Tercile (ref=low)												
Medium				0.205***	0.049	0.013	0.206***	0.049	0.013	0.219***	0.049	0.014
High				0.292***	0.055	0.019	0.291***	0.055	0.019	0.307***	0.055	0.021
Men's Income Tercile (ref=low)												
Medium				0.165***	0.046	0.011	0.169***	0.047	0.011	0.167***	0.047	0.011
High				0.281***	0.051	0.019	0.283***	0.051	0.019	0.285***	0.051	0.019

Table 5: (continued)

	Model 1			Model 2			Model 3			Model 4		
	Coef.	**SE**	**AME**	**Coef.**	**SE**	**AME**	**Coef.**	**SE**	**AME**	**Coef.**	**SE**	**AME**
Women's and Men's Activity Status Interaction (ref=work permanent)												
Work Temp#Work Temporary							-0.267	0.172		-0.337*	0.173	
Work Temp#Self-Employed							0.012	0.186		0.046	0.189	
Work Temp#Unemployed							-0.244	0.279		-0.32	0.282	
Work Temp#Not Active							0.168	0.719		0.41	0.729	
Work Temp#Other							-0.349	0.339		-0.488	0.359	
Self-Employed#Work Temporary							-0.27	0.333		-0.172	0.337	
Self-Employed#Self-Employed							-0.073	0.176		-0.053	0.180	
Self-Employed#Unemployed							-1.112**	0.541		-0.974*	0.549	
Self-Employed#Not Active							0.51	0.855		0.438	0.903	
Self-Employed#Other							-0.68	0.627		-0.481	0.643	
Unemployed#Work Temporary							0.218	0.203		0.255	0.205	
Unemployed#Self-Employed							-0.23	0.234		-0.197	0.238	
Unemployed#Unemployed							-0.13	0.226		-0.175	0.231	
Unemployed#Not Active							1.223**	0.548		1.295**	0.558	
Unemployed#Other							-0.123	0.412		0.021	0.427	
Not Active#Work Temporary							-0.055	0.274		0.088	0.285	
Not Active#Self-Employed							-0.067	0.218		-0.127	0.226	
Not Active#Unemployed							-0.153	0.331		0.063	0.342	
Not Active#Not Active							0.213	0.574		0.158	0.604	
Not Active#Other							-0.499	0.502		-0.045	0.528	
Other#Work Temporary							0.001	0.259		0.203	0.275	

Table 5: (continued)

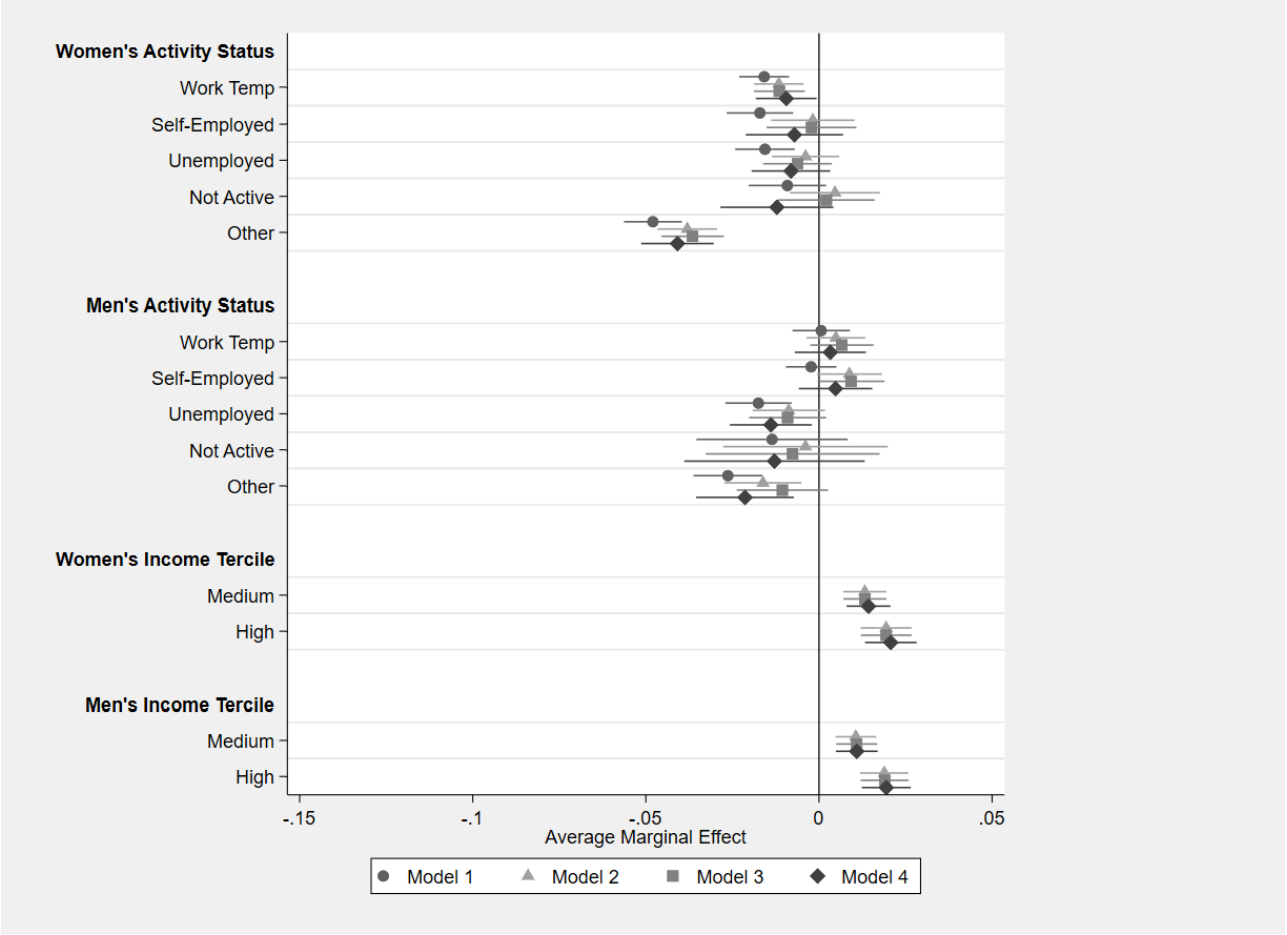
	Model 1			Model 2			Model 3			Model 4		
	Coef.	**SE**	**AME**	**Coef.**	**SE**	**AME**	**Coef.**	**SE**	**AME**	**Coef.**	**SE**	**AME**
Other#Self-Employed							0.016	0.270		0.096	0.284	
Other#Unemployed							-0.065	0.332		0.02	0.345	
Other#Not Active							-0.412	1.083		0.181	1.100	
Other#Other							-0.401	0.253		-0.422	0.289	
Europe Area (ref=northern)												
Western										-0.35	0.285	-0.014
Southern										-0.584*	0.301	-0.020
CEE										-0.687***	0.260	-0.024
Europe Area and Women's Activity Status Interaction (ref=northern, work permanent)												
Western#Work Temporary										-0.137	0.208	
Western#Self-Employed										0.27	0.275	
Western#Unemployed										0.385	0.265	
Western#Not Active										0.778	0.492	
Western#Other										-0.609**	0.253	
Southern#Work Temporary										-0.367	0.247	
Southern#Self-Employed										0.517*	0.279	
Southern#Unemployed										0.324	0.274	
Southern#Not Active										1.153**	0.489	
Southern#Other										0.407	0.309	
CEE#Work Temporary										0.251	0.222	
CEE#Self-Employed										0.104	0.299	
CEE#Unemployed										0.526**	0.255	
CEE#Not Active										0.86*	0.506	
CEE#Other										0.402*	0.229	

Table 5: (continued)

	Model 1			Model 2			Model 3			Model 4		
	Coef.	**SE**	**AME**	**Coef.**	**SE**	**AME**	**Coef.**	**SE**	**AME**	**Coef.**	**SE**	**AME**
Europe Area and Men's Activity Status Interaction (ref=northern, work permanent)												
Western#Work Temporary										0.461*	0.250	
Western#Self-Employed										0.5**	0.209	
Western#Unemployed										0.324	0.314	
Western#Not Active										2.798**	1.119	
Western#Other										-0.226	0.277	
Southern#Work Temporary										0.193	0.289	
Southern#Self-Employed										0.544**	0.215	
Southern#Unemployed										0.113	0.354	
Southern#Not Active										2.694**	1.169	
Southern#Other										-0.516	0.529	
CEE#Work Temporary										0.476*	0.266	
CEE#Self-Employed										0.425*	0.221	
CEE#Unemployed										0.733**	0.296	
CEE#Not Active										2.622**	1.173	
CEE#Other										-0.092	0.303	
Random-Effects Parameter	**Estimate**	**SE**		**Estimate**	**SE**		**Estimate**	**SE**		**Estimate**	**SE**	
var(calendar year)	0.0016	0.0009		0.0016	0.0008		0.0016	0.0008		0.0016	0.0008	
var(intercept)	0.1367	0.0471		0.1243	0.0432		0.1143	0.0404		0.0964	0.0360	
var(calendar year, intercept)	-0.0052	0.0048		-0.0041	0.0045		-0.0038	0.0043		-0.0039	0.0045	
AIC	27525.99			27463.76			27495.79			27471.79		
BIC	27865.04			27856.35			28209.59			28533.57		
Couple-Waves	55410			55410			55410			55410		
Couples	30126			30126			30126			30126		
Countries	25			25			25			25		

Source: authors' elaboration on EU-SILC data
*Notes: * p≤0.1, ** 0.01<p≤0.05, *** p≤0.01; Models also include missing categories*

Figure 6: AMEs coefficients plot for the covariate main activity status and income tercile of both partners



Source: authors' elaboration on EU-SILC data

The first research question concerned how and how much the main activity status influence fertility in couple. Looking at Model 1 we note, for women, a negative association between the different activity status and the hazard of having the first child respect to the reference category (permanent work). In particular, for temporary workers, unemployed and self-employed the hazard for the conception of first child decreases of about 1.6% compared to permanent workers. For men, the coefficients are negative, except for the category "work temporary" which however is not significant. Moreover, the coefficients for men results less strong than for women, save for the "unemployed" category which has a decrease of about 1.7% on the hazard respect to the reference category ("work permanent"). In general, for employed individuals, a work contract of limited duration is associated with a lower fertility risk.

The second model specification addresses the second research question analysing the eventual change of main activity status when we insert the variables linked to family income. We observe that for women most of the coefficients lose significance and magnitude, and the association becomes positive, even not significant, for the category "not active". For men, in addition to the negative coefficients find in Model 1, we observe a positive association with the hazard of the category "self-

employed" when we control for the income variables. Almost all the coefficients of this second model specification present values that are lower than the one found in the previous model. So, once we consider the income variables the income effect mediates the activity status effect.

The third model specification analyse the association between different main activity status combinations of couples' member on the hazard. We observe a negative association with the hazard in the couple where the women are self-employed and the men unemployed respect to the reference category (both permanent workers). This negative association remains also if we consider the main effect: in fact, from the combination between the "self-employed/unemployed" interaction and the relative main effect categories for women and men, we obtain anyway a negative value of -0.984. In general, when both partners are permanent workers, we note the greatest hazard of having the first child in the next year. Overall, the combination of the partners' activity status leads to different association with the hazard, even if in this model only few coefficients are statistically significant.

The last model specification addresses the research question, on the different effects that various combinations of activity status and macro-area of residence have on hazard. In this model, we note that the coefficients for Southern and CEE countries are negative and significant, so for these countries we observe a decrease (respect to Nordic countries) on the hazard. Furthermore, for women, we note a positive association with the hazard for those who are not active in Southern, and for those who are unemployed in Central and Eastern countries. For men, results show a positive effect for those who are self-employed in Western, Southern and CEE countries. Moreover, the relation with hazard results positive also for those who are temporary workers in Western and CEE countries. The high coefficients, that emerge in the last model about the interaction between macro-area of residence and the category "not active", are probably due at the low number of observed cases compared to the total number of records in the groups identified by these combinations.

Looking at the coefficients of the main activity status, in the latest model, we observe that: for women the coefficients are negative and significant for the category unemployed and not active; instead, for men remain significant the coefficient linked to not active category with strong negative value.

The control variables go in the expected direction. The age of the respondents at the time of first interview does not have a specific trend, in fact, for men we note a positive association with the hazard (respect to the reference category 25-30 years) only in the category 30-35 years while in the other categories the association is negative. For women, instead, we observe a positive association with hazard until 25 years then the association became negative, particularly in the last category (40+ years). The results for the variable "partnership status" confirm the established finding that fertility

is higher for married than for cohabiting couples. Partners of higher education are more likely to have a first child, in the observed period, than partners with low educational levels. These findings accord with recent literature (Nitsche, Matysiak, Van Bavel, Vignoli 2018).

The four models of Table 5 have similar values of the fit indexes AIC and BIC, with model 2 reaching the lowest value. In order to evaluate the goodness-of-fit of the models, we report in Figure 7 four calibration plots, one for each model. In addition, to indicate how well the models work together with the graph, we report some statistics: Expected/Observed ratio (E:O), calibration-in-the-large (CITL), calibration slope (Slope) and concordance index (AUC). The statistics reported below are described in paragraph 3.2. To assess if the calibration slope and CITL reach the optimal value of 1 and 0 respectively we make a test at 5% significance level (Table 7). Together with these tests we report also, the Hosmer-Lemeshow test, that is a test that evaluates whether (or not) the observed event rates match expected event rates in subgroups of the model population.

Table 6: Goodness-of-Fit statistics

Statistic	Model 1	Model 2	Model 3	Model 4
E:O	0.980	0.978	0.976	0.973
CITL	0.024	0.026	0.029	0.033
Slope	0.897	0.902	0.890	0.878
AUC	0.774	0.777	0.777	0.777

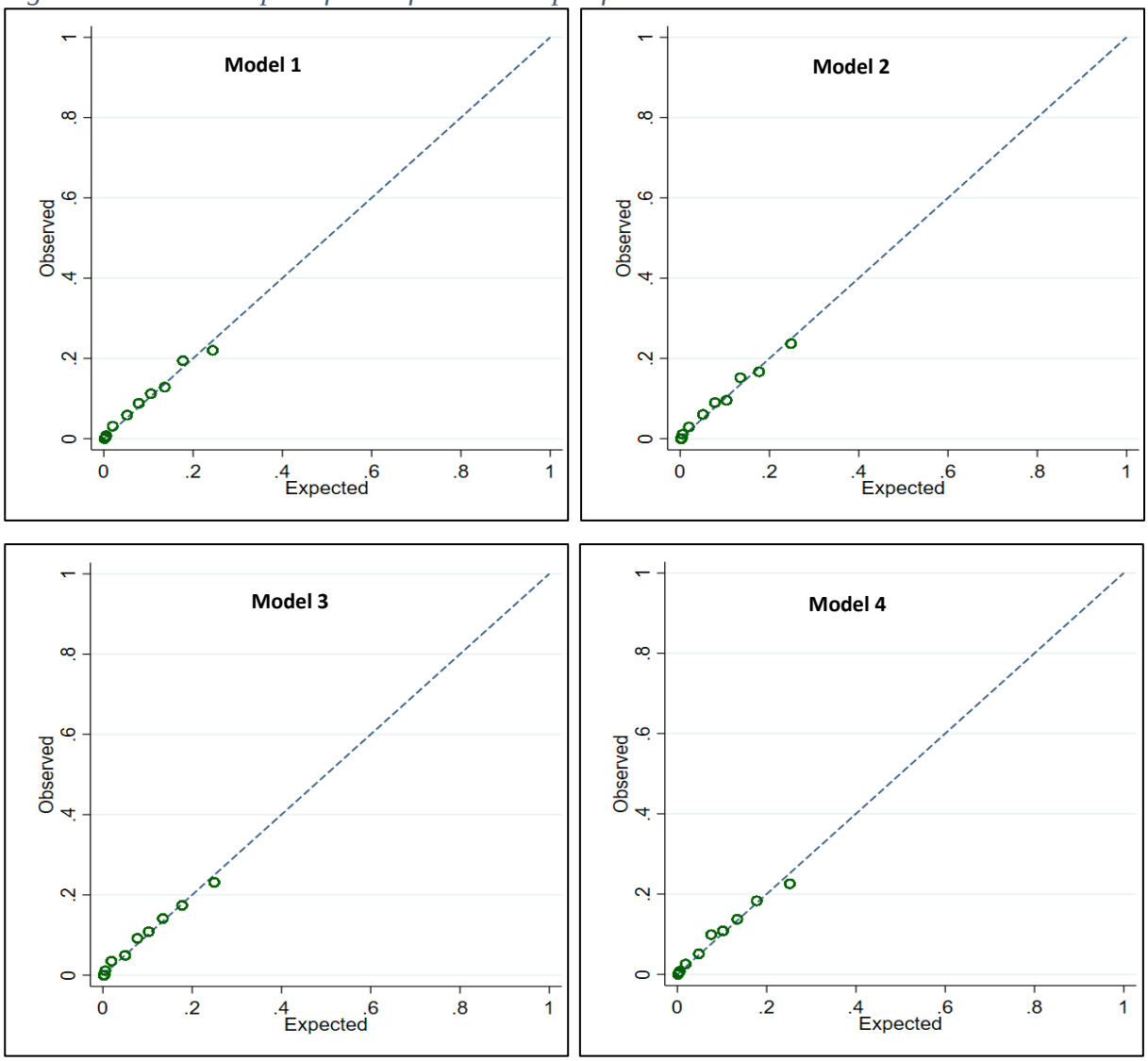
Source: Authors' elaboration on EU-SILC data

Table 7: Goodness-of-Fit tests

Test	Model 1	Model 2	Model 3	Model 4
Hosmer-Lemeshow	0.459	0.202	0.096	0.485
Slope (equal to 1)	0.082	0.096	0.057	0.032
CITL (equal to 0)	0.633	0.605	0.569	0.519

Source: Author's elaboration on EU-SILC data

Figure 7: Calibration plots for the four model specifications



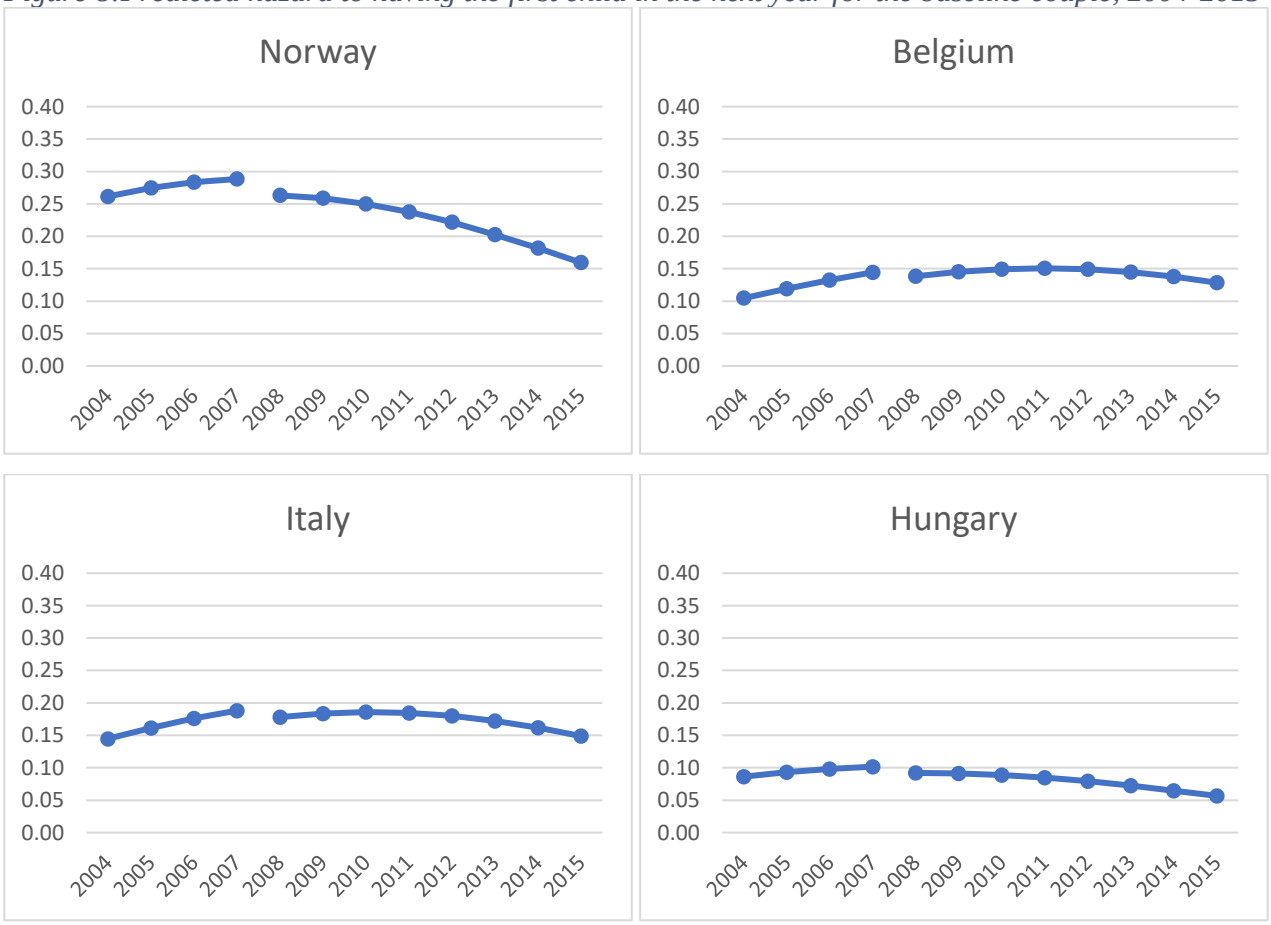
Source: authors' elaboration on EU-SILC data

Observing Figure 7 and Table 6 we note that the expected/observed ratio has a value of about 0.98 and CITL has a value below 0.035 in all the four graphs. The value of the calibration slope, despite a small decrease across models, remain around 0.9. Moreover, we never reject the null hypothesis of the tests for equality to one of calibration slope and to zero of calibration-in-the-large, except in Model 4 where the p-value of test for slope is below 0.05. The value of concordance index remains stable around 0.77 across the models. Finally, the Hosmer-Lemeshow tests permit us to conclude that, at 5% confidence level, the observed and expected proportions are the same across all groups. Overall, we can conclude that all the four model specifications seem to perform sufficiently well in the validation sample and so our models have a good fit.

We provide some explanatory graphs below, using the model 4, in order to see the trend of the predicted hazard. In Figure 8 we report the levels of predicted hazard, calculated with estimated

regression coefficients for the baseline couple (married, both partners 25-30 years, permanent workers, in the lowest tercile of income, low education) and Empirical Bayes estimation of random effects, from 2004 to 2015 for the baseline couple. Given maximum likelihood (ML) estimates of fixed and variance-covariance parameters we can estimate the level-2 residuals as mean of the posterior distribution of the random effects (that is Empirical Bayes estimation). The EB residuals minimize the mean squared error (MSE) of prediction, indeed they are also known as BLUP (Best Linear Unbiased Prediction). For an easy and better visualization of the graphs we show below only one country for each macro-area, since the trend of the hazard is very similar between countries of the same macro-area (the remaining graphs are reported in the appendix, Figure A5). The graphs below present a discontinuity caused by the presence in the models of a dummy that assumes value zero before the 2008 and one after, so up to 2008 the hazard includes the effect of this variable.

Figure 8:Predicted hazard to having the first child in the next year for the baseline couple, 2004-2015



Source: author's elaboration on EU-SILC data, using empirical Bayes estimates of random effects

From the graphs above we note that, Nordic (Norway as example) countries show after 2008 a downward shift and a decreasing trend that continue until the end of the observation period. Western countries (Belgium as example) show a linear increase in the value of the hazard until 2008; after this

period, despite a downward shift, the hazard is more stable, than in the Northern countries. We observe, furthermore, that in these countries the decline starts some year after 2008, around 2011. In the Southern of Europe, after 2008 the graphs show a decreasing trend. Finally, for Central and Eastern countries, after 2008 we observe a little downward shift, moreover the predicted hazard is stable along the period 2004-2015. To evaluate the trend obtained with the predicted hazard we compare it with the trend of TFR obtain by EUROSTAT data. In general, there are only slights differences in the two trends; the only noticeable difference is for Lithuania, where the trend of TFR is increasing along the period 2004-2015, instead for the predicted hazard the trend became decreasing from 2009. The other small differences are: for Denmark, Norway, Greece, Portugal, Czech Republic and Estonia it exists a slight divergence of the two trends for 2014 and 2015; for Western country, from 2004 to 2008, there is an increasing trend in the predicted hazard that do not emerge completely in the TFR, that is more stable across this period. These small differences are probably due to the fact that the TFR measure all parities while our analysis is based only on first conception. Overall, we can claim that the trend of predicted hazard is in line with the trend of TFR for the period and countries observed. So, our model has good properties of prediction in term of hazard of having the first child in the next year.

In Figure 9 we report the level of the predicted hazard (using model 4) for the baseline couple and for couples where the activity status of one of the partners is "not active" instead "work permanent". Curves are constructed using the model coefficients and the Empirical Bayes estimates of random effects. Since, also in this case, the trend of the hazard is very similar between the countries of the same macro-area, we report only one country as example for each macro-area (the rest of the graph are reported in the Appendix, Figure A6).

Figure 9: Levels of predicted hazard when the activity status of one of the partners in couple is "not active" instead of "work permanent", 2004-2015

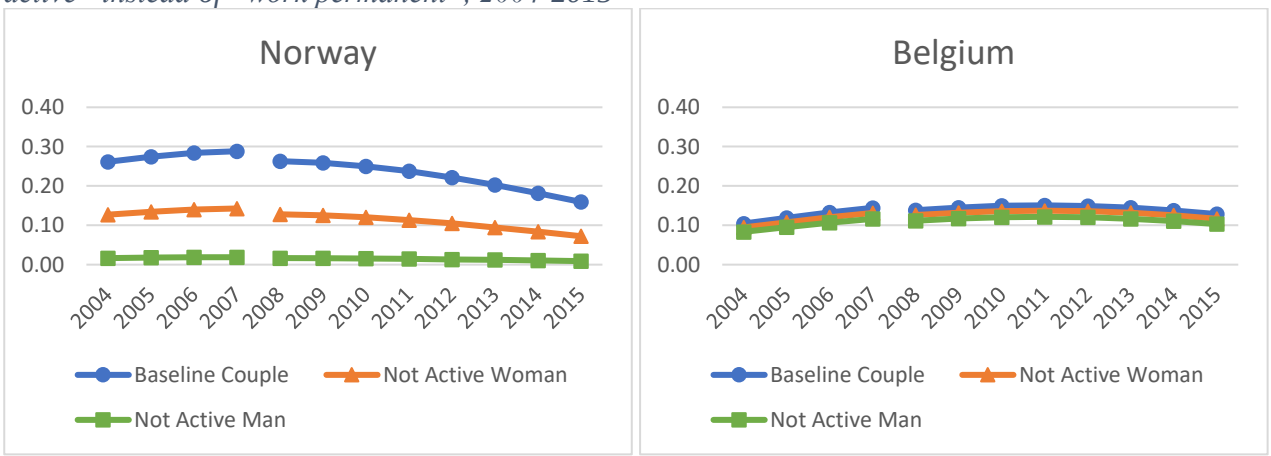
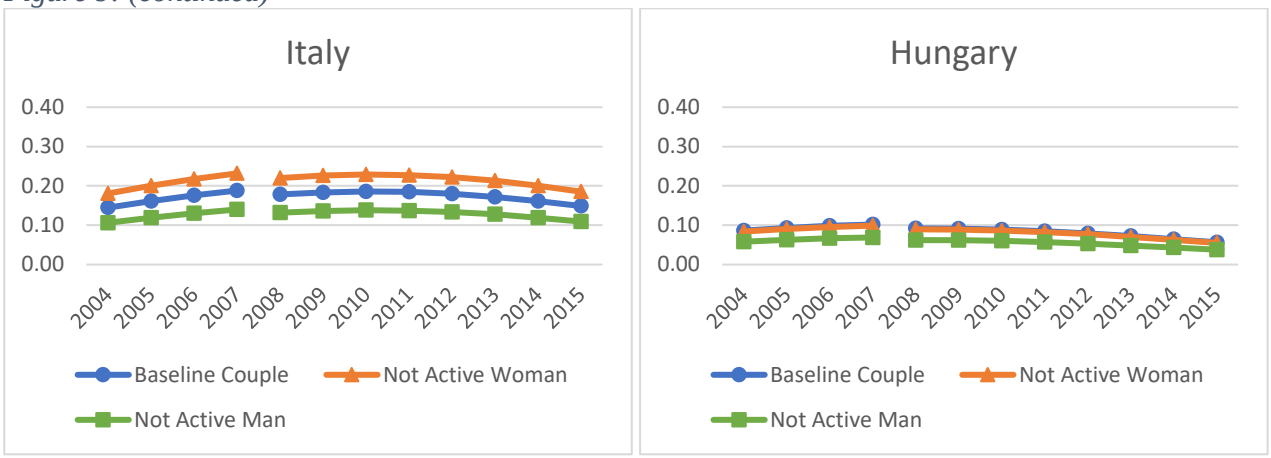


Figure 9: (continued)



Source: author's elaboration on EU-SILC data, using empirical Bayes estimates of random effects

Net of the general country-specific trend, the baseline couple (married, both partners 25-30 years, permanent workers, in the lowest tercile of income, low education and lives in Nordic country) has the same hazard of the couples in which the woman is not active in Western and CEE countries, while if the man is not active the hazard decreases (especially for Central and Eastern European countries). For Northern countries, the difference between the three types of couples is more evident, and we observe a decreasing effect on the hazard when one of the partners is not active respect to the baseline couple. The decrease is stronger if the man is not active, in fact, in this case the hazard is close to zero. For Southern countries we observe that, the couples in which the woman is not active have a greater hazard than baseline couple. Conversely if the man is not active the hazard of having the first child in the next year decreases. From the analysis of these graphs, it emerges that, for the Southern Europe, the male breadwinner model that maximizes, on the one hand, men's income security and, on the other, women's time availability at home still constitutes the "best" environment to facilitate first conceptions.

4.3 Detecting the role of the Great Recession

The difference in the trends of European countries in terms of TFR, over time, emerge also in the Figure 8 above about the countries' hazard of having the first child. In fact, for some countries a decreasing trend in the hazard is visible in the years immediately after the start of the crisis; while in other countries the decreasing trend is visible only after few years, and for still other the decreasing trend of the hazard is very small along the period analysed. Despite these differences, in almost all the countries analysed we observe a change in the trend of the hazard after 2008.

There are cases where changes in factors outside of the model cause changes in the underlying relationship between the variables in the model. Structural break models capture exactly these cases by incorporating sudden, permanent changes in the parameters of models. Given the different hazard

trend observed across European countries in the years after the start of the crisis, it is interesting to use the econometric theory of structural break to make a systematic analysis of the impact of the Great Recession across these countries.

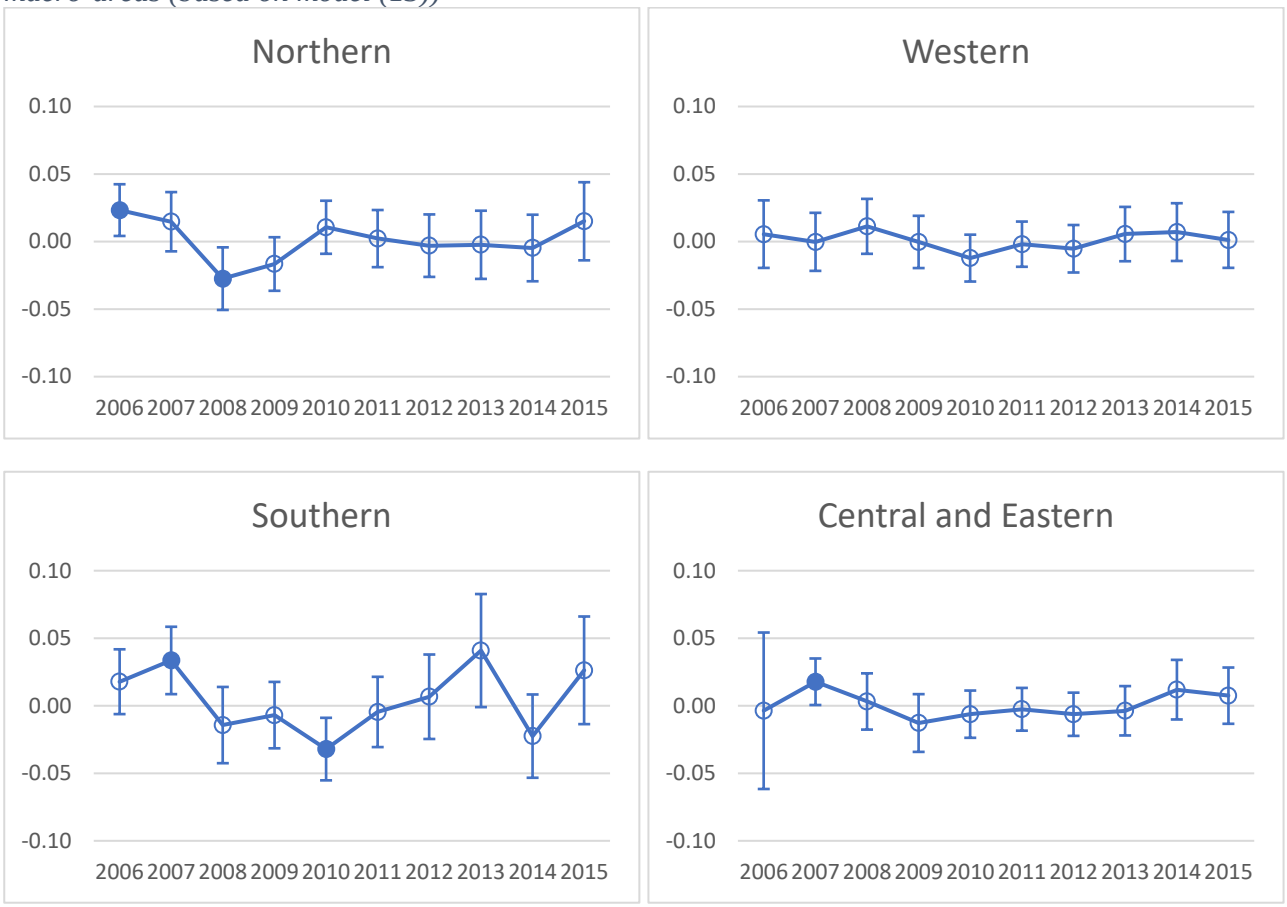
Below we report a table with the p-value of the Chow test (equation [15]) for years 2006-2015, for each macro-area (North, South, East, West), in which the dataset is divided (Table 8). The tests reported below are described in paragraph 3.3. We do not use the years 2004 and 2005 because too few countries are observed in these years. Moreover, we provide a graph that represent the trends of AME for the values of the dummy year variable. The graph reports also (circle empty or not) the significance of the shift test. These two tests permit us to verify, on one hand, if there is a change in the slope and, on the other hand, if there is the presence of a downward or upward shift.

Table 8: P-value of Chow test for the slope (equation (15)) for years 2006-2015 and for each macro-area

Year	North	West	South	East
2006	0.0641*	0.6008	0.4058	1.000
2007	0.1243	0.1713	0.0216**	0.0378**
2008	0.2694	0.8526	0.1780	0.0846*
2009	0.1357	0.7512	0.0319**	0.0347**
2010	0.0314**	0.9493	0.0295**	0.0058***
2011	0.3810	0.8729	0.0081***	0.0879*
2012	0.1764	0.7488	0.1498	0.4790
2013	0.0154**	0.2353	0.0860*	0.6079
2014	0.2230	0.0782*	0.3763	0.2357
2015	0.3718	0.0263**	0.4037	0.3755

Source: Author elaboration of dataset EU-SILC
*Notes: * $p \leq 0.1$, ** $0.01 < p \leq 0.05$, *** $p \leq 0.01$*

Figure 10: AME and confidence interval for the values of dummy year variable (shift test) for the four macro-areas (based on model (13))



Source: Author elaboration of dataset EU-SILC
Notes: The dot is full if the test is significant ($p \leq 0.05$) and empty if not

The structural breaks analysis does not detect a significant p-value for the Wald test for Western countries (Figure 10); hence, we do not observe a negative or positive shift. Moreover, for Western countries we do not detect significant p-value for the change in slope (Table 8), except in 2014 and 2015; so, in these countries there are not shift change in any period observed and the slope change occur only in 2014 and 2015. For Nordic countries we find two significant p-value (considering 0.05 as threshold), for the shift test, in 2006 and 2008 that are related to a positive and negative shift, respectively. Instead for Southern countries we observe a significant p-value for the Wald test in 2007 and 2010 the shift in these years is positive for 2007 and negative for 2010. These results are in line with the fact that the fertility trend is positive until the start of the crisis then we observe a negative shift in 2010. Different is the situation when we look at the p-value for the Chow test; in this case, for Nordic, Southern and CEE countries we observe a change in slope, in 2010 probably due to the postponement effect of the Great Recession. Moreover, Southern and CEE countries appear to have structural change also in 2009 and 2011. In general, from the analysis emerges that the economic and

financial crisis occurred in Europe since 2008 has had an impact on almost all European countries, especially in South and Central and East Europe.

For Northern countries we note structural change also for the year 2006; the presence of a change in slope in this period is probably due to the positive effect of family and financial policies implemented after the financial crisis of the 90's. Overall, from Figure 10, we observe that all the four graphs shows a decreasing trend around 2008, that is the beginning of the Great Recession.

In light of what emerged from the analysis of structural breaks we replicate Model 1 and Model 2 in Table 5 for each of the four macro-area, choosing each time the most appropriate dummy of the year based on the value of AME and its significance (Figure 10). Since the number of countries within the four macro-areas is not high enough for a random effects model, fixed effects ones are used for the following models. For the Northern countries we choose the year 2008, that is the year where the AME is significant and reaches lower value.

Table 9: Coefficients of the models and average marginal effect on the hazard for the conception of the first child for Northern countries, 2004-2015

	Model 1			Model 2		
	Coef.	**SE**	**AME**	**Coef.**	**SE**	**AME**
Country						
Denmark	-1.553***	0.3468		-1.93***	0.3646	
Finland	-1.901***	0.3467	-0.0201	-2.328***	0.3682	-0.0230
Iceland	-0.866**	0.3507	0.0567	-1.331***	0.3731	0.0489
Norway	-1.194***	0.3307	0.0265	-1.602***	0.3512	0.0244
Sweden	-1.195***	0.3437	0.0264	-1.601***	0.3630	0.0246
Wave (ref=1)						
1	0.532**	0.2322		0.585**	0.2338	
2	0.481**	0.2334	-0.0038	0.51**	0.2341	-0.0057
3	-0.3420	0.2528	-0.0500	-0.3270	0.2535	-0.0519
Post-2008	-0.364**	0.1543	-0.0266	-0.375**	0.1548	-0.0274
Women's Age (ref=25-30)						
15-25	-0.234**	0.1079	-0.0209	-0.186*	0.1089	-0.0171
30-35	0.0700	0.0919	0.0069	0.0250	0.0933	0.0024
35-40	-0.852***	0.1702	-0.0614	-0.911***	0.1720	-0.0650
40+	-4.221***	0.4792	-0.1144	-4.282***	0.4800	-0.1162
Men's Age (ref=25-30)						
15-25	-0.454***	0.1345	-0.0291	-0.423***	0.1353	-0.0275
30-35	0.1170	0.0897	0.0091	0.0780	0.0905	0.0061
35-40	-0.0530	0.1285	-0.0039	-0.0870	0.1295	-0.0063
40+	-0.689***	0.1913	-0.0407	-0.708***	0.1921	-0.0418
Partnership Status (ref=married)						
Cohabitation	-0.562***	0.0766	-0.0434	-0.563***	0.0769	-0.0432

Table 9: (continued)

	Model 1			Model 2		
	Coef.	**SE**	**AME**	**Coef.**	**SE**	**AME**
Women's Education (ref=low)						
medium	0.1820	0.1628	0.0108	0.1400	0.1635	0.0085
high	0.487***	0.1669	0.0323	0.406**	0.1685	0.0271
Men's Education (ref=low)						
medium	0.2020	0.1293	0.0134	0.1970	0.1297	0.0131
high	0.224*	0.1362	0.0150	0.1920	0.1372	0.0127
Women's Activity Status (ref=work permanent)						
Work Temp	-0.2040	0.1330	-0.0172	-0.1270	0.1347	-0.0102
Self-Employed	-0.573***	0.2211	-0.0432	-0.2260	0.2355	-0.0177
Unemployed	-0.578***	0.2008	-0.0434	-0.3030	0.2122	-0.0231
Not Active	-1.041**	0.4379	-0.0674	-0.759*	0.4437	-0.0498
Other	-0.929***	0.1311	-0.0623	-0.655***	0.1489	-0.0445
Men's Activity Status (ref=work permanent)						
Work Temp	-0.465**	0.1916	-0.0329	-0.416**	0.1932	-0.0291
Self-Employed	-0.449***	0.1557	-0.0320	-0.385**	0.1725	-0.0272
Unemployed	-0.791***	0.2386	-0.0503	-0.643***	0.2470	-0.0417
Not Active	-2.101**	1.0199	-0.0874	-2.002**	1.0216	-0.0835
Other	-0.438***	0.1414	-0.0313	-0.306*	0.1563	-0.0222
Calendar Year (centered on 2008)	0.064**	0.0327	0.0019	0.059*	0.0328	0.0014
Squared Calendar Year (centered on 2008)	-0.014***	0.0048		-0.015***	0.0048	
Women's Income Tercile (ref=low)						
Medium				0.307***	0.1047	0.0203
High				0.439***	0.1195	0.0304
Men's Income Tercile (ref=low)						
Medium				0.0910	0.1007	0.0062
High				0.216**	0.1096	0.0152
AIC	6105.594			6094.434		
BIC	6387.987			6421.416		
Couples	6935			6935		
Country	5			5		

Source: Authors elaborations on dataset EU-SILC

From Table 9 we note that, the association between the coefficients of main activity status and the hazard of both women and men is negative as in the general model. When we control also for the income tercile, for women, almost all the coefficients of main activity status lose significance, but the coefficients of category "not active" remain significative with negative value. For men, instead, all the coefficients remain significative with negative value, also the coefficient of "self-employed" category which in the general models was positive. The other control variables go in the same direction of the general model, except the variable women's age that result positive, even if not significant, only in the category 30-35.

For Western countries no coefficients of AME in Figure 10 results significant, so we choose the one with the lowest value that is in 2010 year.

Table 10: Coefficients of the models and average marginal effect on the hazard for the conception of the first child for Western countries, 2004-2015

	Model 1			Model 2		
	Coef.	**SE**	**AME**	**Coef.**	**SE**	**AME**
Country						
Austria	-2.228***	0.2295		-2.549***	0.2401	
Belgium	-2.021***	0.2207	0.0124	-2.353***	0.2325	0.0117
Switzerland	-2.242***	0.2582	-0.0008	-2.488***	0.2665	0.0034
France	-1.372***	0.2042	0.0652	-1.718***	0.2166	0.0628
Netherland	-1.631***	0.2288	0.0415	-1.961***	0.2401	0.0407
United Kingdom	-2.073***	0.2222	0.0091	-2.39***	0.2329	0.0093
Wave (ref=1)						
1	0.615***	0.1399		0.673***	0.1411	
2	0.531***	0.1420	-0.0068	0.557***	0.1424	-0.0094
3	0.0590	0.1533	-0.0385	0.0730	0.1536	-0.0413
Post-2010	-0.1580	0.1141	-0.0122	-0.1590	0.1142	-0.0122
Women's Age (ref=25-30)						
15-25	-0.0360	0.0818	-0.0036	0.0130	0.0828	0.0014
30-35	0.173**	0.0767	0.0185	0.137*	0.0774	0.0145
35-40	-0.495***	0.1195	-0.0416	-0.543***	0.1205	-0.0454
40+	-3.254***	0.2485	-0.1133	-3.311***	0.2492	-0.1151
Men's Age (ref=25-30)						
15-25	-0.219**	0.1079	-0.0171	-0.1770	0.1084	-0.0141
30-35	-0.0090	0.0720	-0.0007	-0.0390	0.0725	-0.0032
35-40	-0.1270	0.1009	-0.0102	-0.1610	0.1015	-0.0129
40+	-0.819***	0.1365	-0.0520	-0.829***	0.1373	-0.0528
Partnership Status (ref=married)						
Cohabitation	-0.771***	0.0597	-0.0633	-0.774***	0.0598	-0.0633

Table 10: (continued)

	Model 1			Model 2		
	Coef.	**SE**	**AME**	**Coef.**	**SE**	**AME**
Women's Education (ref=low)						
medium	0.1370	0.1279	0.0095	0.0870	0.1286	0.0062
high	0.285**	0.1302	0.0208	0.1940	0.1320	0.0143
Men's Education (ref=low)						
medium	0.0590	0.1014	0.0045	0.0110	0.1019	0.0008
high	-0.0250	0.1056	-0.0019	-0.1290	0.1079	-0.0097
Women's Activity Status (ref=work permanent)						
Work Temp	-0.289***	0.0880	-0.0224	-0.229**	0.0898	-0.0175
Self-Employed	-0.277**	0.1398	-0.0215	-0.1060	0.1619	-0.0085
Unemployed	-0.1710	0.1263	-0.0138	-0.0290	0.1319	-0.0024
Not Active	-0.328*	0.1798	-0.0250	-0.1410	0.1876	-0.0111
Other	-1.482***	0.1875	-0.0763	-1.292***	0.1944	-0.0684
Men's Activity Status (ref=work permanent)						
Work Temp	0.1040	0.0948	0.0084	0.191**	0.0971	0.0154
Self-Employed	0.0240	0.1054	0.0019	0.227*	0.1235	0.0184
Unemployed	-0.31**	0.1544	-0.0217	-0.1470	0.1589	-0.0105
Not Active	0.0720	0.3112	0.0057	0.2580	0.3144	0.0211
Other	-0.551***	0.2035	-0.0355	-0.3300	0.2096	-0.0222
Calendar Year (centered on 2008)	0.116***	0.0279	0.0032	0.108***	0.0279	0.0027
Squared Calendar Year (centered on 2008)	-0.016***	0.0036		-0.015***	0.0036	
Women's Income Tercile (ref=low)						
Medium				0.219***	0.0791	0.0158
High				0.3***	0.0863	0.0223
Men's Income Tercile (ref=low)						
Medium				0.226***	0.0755	0.0164
High				0.346***	0.0834	0.0261
AIC	9564.771			9540.107		
BIC	9869.352			9891.547		
Couples	9558			9558		
Country	6			6		

Source: Authors elaborations on dataset EU-SILC

For Western countries, in Model 1, we observe that the coefficients of main activity status for women have all a negative association with the hazard; conversely for men, result negative and significant

only the coefficients of the category "unemployed". When we control also for the income tercile, for women, almost all the coefficients of main activity status lose significance, remain significant the coefficient of "work temporary" category with negative value, so to have a temporary contract for women leads to a negative association with the hazard to have the first child in the next year. Differently from the general model the coefficients of men's age result all negative, instead for women's age we observe a positive and significant value in the category 15-25 and 30-35 years. The other control variables go in the same direction of the general model in Table 5.

For Southern countries we choose the 2010 year, that is where the value of AME in Figure 10 is significant and reaches the lower value.

Table 11: Coefficients of the models and average marginal effect on the hazard for the conception of the first child for Southern countries, 2004-2015

	Model 1			Model 2		
	Coef.	**SE**	**AME**	**Coef.**	**SE**	**AME**
Country						
Greece	-1.987***	0.2153		-2.494***	0.2676	
Italy	-1.898***	0.1938	0.0074	-2.374***	0.2470	0.0099
Portugal	-3.157***	0.2787	-0.0640	-3.681***	0.3202	-0.0633
Wave (ref=1)						
1	0.881***	0.1414		0.947***	0.1484	
2	0.491***	0.1508	-0.0319	0.496***	0.1512	-0.0367
Post-2010	-0.387***	0.1490	-0.0309	-0.403***	0.1498	-0.0321
Women's Age (ref=25-30)						
15-25	0.2240	0.1424	0.0277	0.269*	0.1433	0.0342
30-35	-0.0950	0.0958	-0.0106	-0.1300	0.0965	-0.0146
35-40	-0.578***	0.1373	-0.0548	-0.634***	0.1383	-0.0603
40+	-2.395***	0.2209	-0.1257	-2.464***	0.2222	-0.1300
Men's Age (ref=25-30)						
15-25	0.4220	0.2624	0.0425	0.439*	0.2630	0.0446
30-35	0.1540	0.1104	0.0143	0.1370	0.1113	0.0127
35-40	-0.234*	0.1333	-0.0192	-0.255*	0.1345	-0.0208
40+	-0.602***	0.1627	-0.0435	-0.612***	0.1636	-0.0443
Partnership Status (ref=married)						
Cohabitation	-0.715***	0.1005	-0.0510	-0.729***	0.1008	-0.0517
Women's Education (ref=low)						
medium	0.1490	0.1061	0.0112	0.0940	0.1072	0.0071
high	0.421***	0.1270	0.0345	0.333***	0.1297	0.0273
Men's Education (ref=low)						
medium	0.0280	0.0938	0.0022	-0.0180	0.0947	-0.0015
high	0.1390	0.1252	0.0114	0.0640	0.1277	0.0053

Table 11: (continued)

	Model 1			Model 2		
	Coef.	**SE**	**AME**	**Coef.**	**SE**	**AME**
Women's Activity Status (ref=work permanent)						
Work Temp	-0.492***	0.1328	-0.0366	-0.418***	0.1363	-0.0290
Self-Employed	-0.1020	0.1246	-0.0086	0.298*	0.1697	0.0260
Unemployed	-0.311**	0.1295	-0.0245	-0.0270	0.1567	-0.0021
Not Active	-0.0210	0.1144	-0.0018	0.281*	0.1524	0.0244
Other	-0.586**	0.2430	-0.0423	-0.2760	0.2636	-0.0200
Men's Activity Status (ref=work permanent)						
Work Temp	-0.0970	0.1434	-0.0078	-0.0270	0.1478	-0.0022
Self-Employed	0.0140	0.0912	0.0012	0.1210	0.1381	0.0102
Unemployed	-0.598***	0.2156	-0.0409	-0.463**	0.2270	-0.0321
Not Active	-0.1530	0.3026	-0.0121	-0.0180	0.3127	-0.0014
Other	-1.095**	0.4676	-0.0634	-0.873*	0.4764	-0.0527
Calendar Year (centered on 2008)	0.054**	0.0266	0.0031	0.058**	0.0267	0.0034
Squared Calendar Year (centered on 2008)	-0.007*	0.0041		-0.007*	0.0041	
Women's Income Tercile (ref=low)						
Medium				0.254*	0.1309	0.0193
High				0.447***	0.1479	0.0363
Men's Income Tercile (ref=low)						
Medium				0.1180	0.1228	0.0088
High				0.345***	0.1329	0.0278
AIC	5045.397			5031.833		
BIC	5294.458			5323.59		
Couples	5164			5164		
Country	3			3		

Source: Authors elaborations on dataset EU-SILC

For Southern countries, in Model 1, we observe that the coefficients of main activity status for women result to have all a negative association with the hazard; conversely for men, result positive, even if not significant, the coefficient of the category “self-employed”. When we control also for the income tercile, for women, remain significant the coefficient of “work temporary” category with negative value and the coefficients of “self-employed” and “not active” categories with positive values. So, for Southern countries to be not active, for women, have a positive association with the hazard of have the first child in the next year. For men, controlling also for income tercile, does not change the

signs and significance of the coefficients of the main activity status variable. Differently from the general model the coefficients of men's age result positive until 35 years old. The other control variables go in the same direction of the general model in Table 5.

Finally, for CEE countries we choose the year 2009, below we report the table of results.

Table 12: Coefficients of the models and average marginal effect on the hazard for the conception of the first child for Central and Eastern countries, 2004-2015

	Model 1			Model 2		
	Coef.	**SE**	**AME**	**Coef.**	**SE**	**AME**
Country						
Bulgaria	-2.989***	0.2795		-3.148***	0.2913	
Czech Republic	-2.958***	0.2646	0.0019	-3.103***	0.2757	0.0028
Estonia	-2.986***	0.2721	0.0002	-3.152***	0.2849	-0.0003
Croatia	-2.664***	0.3257	0.0221	-2.85***	0.3393	0.0201
Hungary	-3.456***	0.2670	-0.0240	-3.614***	0.2790	-0.0240
Lithuania	-3.295***	0.3311	-0.0167	-3.457***	0.3416	-0.0169
Latvia	-2.8***	0.2719	0.0123	-2.968***	0.2854	0.0116
Polonia	-2.964***	0.2650	0.0016	-3.126***	0.2782	0.0013
Serbia	-2.632***	0.3513	0.0246	-2.804***	0.3618	0.0236
Slovenia	-2.625***	0.2986	0.0251	-2.806***	0.3124	0.0234
Slovak Republic	-3.407***	0.2860	-0.0219	-3.539***	0.2948	-0.0207
Wave (ref=1)						
1	1.8***	0.1639		1.795***	0.1651	
2	1.448***	0.1697	-0.0230	1.451***	0.1697	-0.0225
Post-2009	-0.2010	0.1697	-0.0125	-0.2060	0.1701	-0.0128
Women's Age (ref=25-30)						
15-25	0.192**	0.0948	0.0186	0.206**	0.0953	0.0201
30-35	-0.24**	0.0939	-0.0199	-0.249***	0.0944	-0.0206
35-40	-0.926***	0.1681	-0.0599	-0.931***	0.1686	-0.0602
40+	-3.502***	0.3016	-0.1022	-3.511***	0.3019	-0.1025
Men's Age (ref=25-30)						
15-25	-0.0940	0.1274	-0.0058	-0.0780	0.1277	-0.0048
30-35	0.0340	0.0837	0.0022	0.0270	0.0839	0.0018
35-40	-0.1750	0.1235	-0.0105	-0.1790	0.1237	-0.0107
40+	-0.612***	0.1823	-0.0313	-0.612***	0.1825	-0.0313
Partnership Status (ref=married)						
Cohabitation	-0.471***	0.0746	-0.0282	-0.478***	0.0748	-0.0286
Women's Education (ref=low)						
medium	-0.1320	0.1547	-0.0076	-0.1480	0.1549	-0.0086
high	0.1390	0.1651	0.0088	0.1100	0.1669	0.0070

Table 12: (continued)

	Model 1			Model 2		
	Coef.	**SE**	**AME**	**Coef.**	**SE**	**AME**
Men's Education (ref=low)						
medium	-0.0010	0.1353	-0.0001	-0.0150	0.1356	-0.0009
high	0.0320	0.1503	0.0019	0.0060	0.1518	0.0004
Women's Activity Status (ref=work permanent)						
Work Temp	-0.0860	0.1083	-0.0055	-0.0650	0.1104	-0.0041
Self-Employed	-0.442**	0.1794	-0.0249	-0.392*	0.2012	-0.0220
Unemployed	-0.216*	0.1184	-0.0132	-0.1440	0.1311	-0.0088
Not Active	-0.3160	0.2098	-0.0186	-0.2430	0.2192	-0.0144
Other	-0.792***	0.1579	-0.0394	-0.707***	0.1714	-0.0355
Men's Activity Status (ref=work permanent)						
Work Temp	0.1030	0.1151	0.0065	0.1270	0.1158	0.0079
Self-Employed	-0.0260	0.1194	-0.0015	0.1210	0.1394	0.0076
Unemployed	-0.0230	0.1334	-0.0014	0.0610	0.1417	0.0037
Not Active	-0.1620	0.4370	-0.0093	-0.0520	0.4414	-0.0030
Other	-0.609**	0.2488	-0.0300	-0.503**	0.2569	-0.0251
Calendar Year (centered on 2008)	0.0680	0.0505	0.0018	0.0590	0.0507	0.0016
Squared Calendar Year (centered on 2008)	-0.0070	0.0064		-0.0060	0.0064	
Women's Income Tercile (ref=low)						
Medium				0.1190	0.0988	0.0070
High				0.1090	0.1149	0.0065
Men's Income Tercile (ref=low)						
Medium				0.1370	0.0950	0.0081
High				0.1360	0.1065	0.0081
AIC	6609.527			6615.303		
BIC	6946.339			6998.045		
Couples	8469			8469		
Country	11			11		

Source: Authors elaborations on dataset EU-SILC

For Central and Eastern countries, in Model 1, we observe that the coefficients of main activity status for women result all negative. When we control also for the income tercile, almost all the coefficients of main activity status lose significance and magnitude, remain significant the coefficient of "self-employed" category with negative value. For men, the coefficients of the category "self-employed"

and “unemployed” became positive, in the second model, but not significant. The other control variables go in the same direction of the model on the entire dataset. Using four different fixed effects models for each macro-area it is possible to evaluate whether the influence of some covariates on the hazard of first conception varies with respect to the general models. From these models it emerges that in the Northern countries, being in the "self-employed" or "work temporary" category for men involves a decrease in the hazard differently from what was observed in the general models where there is a positive association, even if not significant in the case of the "work temporary" category. The women’s age "15-25" category also has a negative coefficient. For Western countries, the only difference that comes up with respect to the general model concerns the women’ age "30-35" category whose coefficient is positive. For the Southern countries, on the other hand, the main differences with respect to the general model concern the men’s age "15-25" category, whose coefficient is positive and the category "self-employed" of women’s main activity status, which presents a positive coefficient. The CEE countries do not present substantial differences. In general, from these models it comes up that, regarding the activity status variable, in the Northern countries, unlike what emerged in the model that compared all the countries, there is a negative association, for men, between the "self-employed" and "work temporary" categories and the hazard of first conception, while in the Southern countries there is a positive association between the category "self-employed" of women’s main activity status and the dependent variable.

5 Employment Uncertainty and the Second Child

In the first section of this chapter, we report an introduction about the link between fertility and job uncertainty, focusing on the conception of the second child. Then we present the results of the four model for the conception of the second child that try to answer to the research question regarding: the influence of the main activity status and work characteristics on fertility, if the income variable mediates the association between activity status and fertility, the possible effect of the gender-specific combination of partners' activity status characteristics on fertility, and the fact that the welfare and labour market regimes moderate the effect of partners' activity status on fertility. After presenting the results of the models, tests are also reported to assert the goodness of fit of these models. As in the case of the conception of the first child, in the third section we present the structural break analysis to verify if the Great Recession influence the couple dynamics leading to the birth of the second child. Then using the results obtained from the structural breaks analysis we reproduce the first two models viewed in the second section for each macro-area of residence.

5.1 Introduction

Due to the onset of the Great Recession and to the fall of fertility rates in Europe, numerous studies have attempted to investigate the relation between economic uncertainty and fertility (e.g. Sobotka et al. 2011; Testa and Basten 2014). In earlier decades factors such as ideological changes have been used to explain the postponement of first births and declining in higher order births. Nowadays is economic uncertainty that emerged as driving force of birth dynamics (Kreyenfeld 2016).

Economic uncertainty linked to unstable labour market can hinder the couple's family and work project (Philipov 2002, Sobotka 2003). But, despite the unfavourable economic conditions, couples continue to have children or in any case they would like to have them. This is because, the desire to become parents remains strong in Europe, and couples believe that the advantages of having a child outweigh the disadvantages (Bernhardt and Goldscheider 2006). In this context, the couple do not want to remain childless, but rather tend to limit the family size (Kohler et al. 2006). So, economic uncertainty result in the postponement of first child rather than the foregoing of parenthood altogether. In line with this is the findings that childless couple did not increased as expected (Van Bavel and Nitsche 2013). Since the social status of being parents is reached without having the second child, economic uncertainty result in low second births rates. Low second births rates are a crucial factor of the low fertility rates across Europe (Van Bavel and Rózańska-Putek 2010). This phenomenon is not linked only with the postponement effect but is also the result of economic insecurity. Once become a parent, the decision to have another child is more related to economic situation that the decision to

have the first child, especially if the will to become parents is strong (Bernhardt and Goldscheider 2006). In this situation, economic conditions are of higher importance, and couple may want to acquire more resources. In general, the decision not to have the second child, after having postponed the first depends on a set of external factors, expectations, and individual preferences (Van Bavel and Rózańska-Putek 2016).

In particular, the impact of employment on childbearing varies by gender and parity. Being in a full-time employment it is a favourable factor for both men and women in the decision to have the first child. The situation is more complex, and vary by gender, if the couple have to decide whether or not to have the second or higher order child. From women's point of view, it is not so important their own work as that of the partner. Instead for men being in a full-time employment is still an important factor in the decision to have another child (Neyer, Lappegård and Vignoli 2013). In general, couple may pose more preconditions for what is necessary to have another child, not only in term of financial features but also in term of the demands of time for childrearing. So, the decrease of the second births rate is also due to the difficulties in combining work and family life (Adsera 2005; Kohler et al. 2006). In different welfare state regimes, the family, the state and the market have a different degree of responsibility in providing child-care, and the labour market is regulated according to different models of participation during the period around the childbirth and when low age children are present in the household. The incompatibility, for women, between work and family life can be reduced, by policy measures such as parental-leave programs and public childcare but also by fathers' engagement in active parenting and a more egalitarian division of household work between partners (Bernhardt 1993).

5.2 Results

We proceed, as in the case of first child, in a stepwise way in order to see changes in the parameters of covariates between models. All the model specifications try to answer to one specific research question. In Model 1 we include the main activity status and work characteristics of both partners, and all the control variables at the individual level, except the men's and women's income terciles, which are inserted in Model 2. In this way we evaluate first if the partners' main activity status influence fertility and then if the family income variable mediates the association between partners' activity status and couples' fertility. In Models 3, we add the interaction between the women's and men's main activity status, in order to verify if the interaction between different welfare regimes and activity status of both member of a couple influence fertility. Finally, in Model 4, we insert the macro-area of residence and its interaction with the main activity status of both partners, in this way we evaluate if interaction between different welfare regimes and activity status of both member of a

couple influence fertility. Moreover, using the same model specification as in the case of the conception of first child permit us to evaluate on which transition (first or second child) the effect of the main activity status of the members of the couple is stronger. For the household composition the reference category is that of married couple; for education is low level; for the activity status is that of permanent workers; and for income tercile is the low tercile. For the areas of residence, the reference category is Northern countries. In Table 13 we report the coefficients and the average marginal effects (AME) of all the covariates. Then we report a graph that show the AMEs values for the covariates: main activity status and income tercile of both partners in the four models. Moreover, in the appendix (Figure A7 - Figure A10) are reported the graphs for the AMEs coefficients for all the covariates separately for each model.

Table 13:Coefficients of the models and average marginal effect on the hazard for the conception of the second child, 2004-2015

	Model 1			Model 2			Model 3			Model 4		
	Coef.	**SE**	**AME**	**Coef.**	**SE**	**AME**	**Coef.**	**SE**	**AME**	**Coef.**	**SE**	**AME**
Wave (ref=1)												
1	-2.296***	0.144		-2.211***	0.148		-2.239***	0.147		-2.016***	0.229	
2	-2.171***	0.145	0.007	-2.079***	0.149	0.007	-2.105***	0.148	0.007	-1.883***	0.230	0.007
3	-2.898***	0.150	-0.025	-2.808***	0.154	-0.025	-2.834***	0.153	-0.025	-2.601***	0.233	-0.025
4	-2.692***	0.187	-0.018	-2.598***	0.190	-0.018	-2.632***	0.189	-0.018	-2.427***	0.258	-0.019
Post-2008	0.049	0.068	0.003	0.05	0.069	0.003	0.052	0.069	0.003	0.047	0.069	0.002
Women's Age (ref=25-30)												
15-25	0.158**	0.064	0.015	0.149**	0.064	0.014	0.145**	0.064	0.013	0.137**	0.064	0.012
30-35	-0.114***	0.038	-0.009	-0.105***	0.038	-0.009	-0.106***	0.038	-0.009	-0.101***	0.038	-0.008
35-40	-0.534***	0.049	-0.038	-0.522***	0.049	-0.037	-0.521***	0.049	-0.037	-0.518***	0.050	-0.037
40+	-3.056***	0.090	-0.093	-3.04***	0.090	-0.092	-3.038***	0.091	-0.092	-3.029***	0.091	-0.095
Men's Age (ref=25-30)												
15-25	-0.037	0.099	-0.002	-0.035	0.099	-0.002	-0.04	0.099	-0.002	-0.057	0.100	-0.003
30-35	0.036	0.045	0.002	0.034	0.045	0.002	0.032	0.045	0.002	0.038	0.045	0.002
35-40	-0.052	0.051	-0.003	-0.058	0.052	-0.003	-0.058	0.052	-0.003	-0.051	0.052	-0.003
40+	-0.544***	0.062	-0.025	-0.555***	0.062	-0.025	-0.555***	0.062	-0.025	-0.547***	0.062	-0.025
Partnership Status (ref=married)												
Cohabitation	-0.164***	0.033	-0.008	-0.161***	0.033	-0.008	-0.163***	0.033	-0.008	-0.172***	0.033	-0.009
Women's Education (ref=low)												
Medium	0.118**	0.051	0.005	0.13**	0.051	0.006	0.129**	0.052	0.006	0.111**	0.052	0.005
High	0.467***	0.056	0.024	0.501***	0.057	0.026	0.499***	0.057	0.026	0.48***	0.057	0.025
Men's Education (ref=low)												
Medium	0.126***	0.046	0.006	0.124***	0.046	0.006	0.125***	0.046	0.006	0.114**	0.046	0.006
High	0.316***	0.052	0.016	0.304***	0.053	0.016	0.303***	0.053	0.016	0.292***	0.053	0.015

Table 13: (continued)

	Model 1			Model 2			Model 3			Model 4		
	Coef.	**SE**	**AME**	**Coef.**	**SE**	**AME**	**Coef.**	**SE**	**AME**	**Coef.**	**SE**	**AME**
Women's Activity Status (ref=work permanent)												
Work Temporary	0.007	0.056	0.000	-0.027	0.057	-0.001	-0.055	0.083	-0.002	0.091	0.220	-0.002
Self-Employed	-0.011	0.066	-0.001	-0.068	0.075	-0.003	0.012	0.108	-0.003	-0.421*	0.248	-0.004
Unemployed	-0.199***	0.061	-0.009	-0.286***	0.065	-0.013	-0.292***	0.088	-0.014	-0.272	0.223	-0.014
Not Active	0.227***	0.039	0.013	0.137***	0.046	0.008	0.167***	0.055	0.008	0.384***	0.150	0.009
Other	-0.247***	0.085	-0.011	-0.341***	0.088	-0.016	-0.256*	0.132	-0.014	-0.118	0.203	-0.015
Men's Activity Status (ref=work permanent)												
Work Temporary	0.027	0.057	0.001	0.036	0.058	0.002	0.057	0.108	0.002	-0.114	0.245	0.001
Self-Employed	0.105**	0.044	0.006	0.133**	0.054	0.007	0.239***	0.078	0.008	0.218	0.158	0.008
Unemployed	0.016	0.067	0.001	0.025	0.070	0.001	0.023	0.121	0.001	-0.032	0.236	0.001
Not Active	-0.207	0.160	-0.010	-0.199	0.161	-0.009	-0.187	0.275	-0.010	-0.096	0.450	-0.009
Other	-0.422***	0.115	-0.018	-0.412***	0.118	-0.018	-0.524**	0.223	-0.017	-0.487*	0.291	-0.017
Calendar Year (centered on 2008)	-0.003	0.018		-0.003	0.018		-0.004	0.018		-0.005	0.018	
Squared Calendar Year (centered on 2008)	-0.001	0.002		-0.001	0.002		-0.001	0.002		-0.0003	0.002	
Women's Income Tercile (ref=low)												
Medium				-0.097**	0.039	-0.005	-0.096**	0.039	-0.005	-0.11***	0.040	-0.006
High				-0.19***	0.045	-0.010	-0.193***	0.045	-0.010	-0.216***	0.045	-0.011
Men's Income Tercile (ref=low)												
Medium				-0.015	0.039	-0.001	-0.016	0.039	-0.001	-0.009	0.039	0.000
High				0.068	0.042	0.004	0.066	0.043	0.003	0.077*	0.043	0.004

Table 13: (continued)

	Model 1			Model 2			Model 3			Model 4		
	Coef.	**SE**	**AME**	**Coef.**	**SE**	**AME**	**Coef.**	**SE**	**AME**	**Coef.**	**SE**	**AME**
Women's and Men's Activity Status Interaction (ref=work permanent)												
Work Temp#Work Temporary							0.028	0.189		-0.024	0.192	
Work Temporary#Self-Employed							-0.106	0.186		-0.17	0.190	
Work Temporary#Unemployed							0.043	0.267		-0.02	0.268	
Work Temporary#Not Active							0.176	0.607		0.062	0.614	
Work Temporary#Other							0.474	0.468		0.376	0.474	
Self-Employed#Work Temporary							-0.469	0.348		-0.601*	0.351	
Self-Employed#Self-Employed							-0.162	0.152		-0.198	0.154	
Self-Employed#Unemployed							-0.492	0.398		-0.584	0.402	
Self-Employed#Not Active							-0.351	0.789		-0.465	0.805	
Self-Employed#Other							0.497	0.586		0.464	0.597	
Unemployed#Work Temporary							0.058	0.209		0.049	0.212	
Unemployed#Self-Employed							-0.096	0.191		-0.079	0.194	
Unemployed#Unemployed							0.113	0.203		0.071	0.206	
Unemployed#Not Active							0.361	0.601		0.37	0.603	
Unemployed#Other							0.068	0.571		-0.007	0.576	
Not Active#Work Temporary							-0.027	0.151		-0.018	0.156	
Not Active#Self-Employed							-0.176	0.109		-0.108	0.113	
Not Active#Unemployed							-0.016	0.171		-0.043	0.173	
Not Active#Not Active							0.034	0.380		0.025	0.382	
Not Active#Other							0.245	0.313		0.137	0.319	
Other#Work Temporary							-0.48	0.387		-0.424	0.396	

Table 13: (continued)

	Model 1			Model 2			Model 3			Model 4		
	Coef.	**SE**	**AME**	**Coef.**	**SE**	**AME**	**Coef.**	**SE**	**AME**	**Coef.**	**SE**	**AME**
Other#Self-Employed							0.13	0.264		0.077	0.277	
Other#Unemployed							0.138	0.342		0.09	0.350	
Other#Not Active							-0.331	1.073		-0.38	1.084	
Other#Other							0.163	0.365		0.067	0.385	
Europe Area (ref=northern)												
Western										0.337	0.220	0.020
Southern										-0.037	0.291	-0.009
CEE										-0.684***	0.241	-0.030
Europe Area and Women's Activity Status Interaction (ref=northern, work permanent)												
Western#Work Temporary										-0.357*	0.215	
Western#Self-Employed										0.24	0.263	
Western#Unemployed										-0.086	0.246	
Western#Not Active										-0.224	0.151	
Western#Other										-0.548**	0.253	
Southern#Work Temporary										-0.106	0.242	
Southern#Self-Employed										0.426	0.261	
Southern#Unemployed										-0.224	0.246	
Southern#Not Active										-0.614***	0.166	
Southern#Other										-0.188	0.370	
CEE#Work Temporary										0.033	0.215	
CEE#Self-Employed										0.734***	0.258	
CEE#Unemployed										0.155	0.224	
CEE#Not Active										-0.021	0.153	
CEE#Other										0.148	0.237	

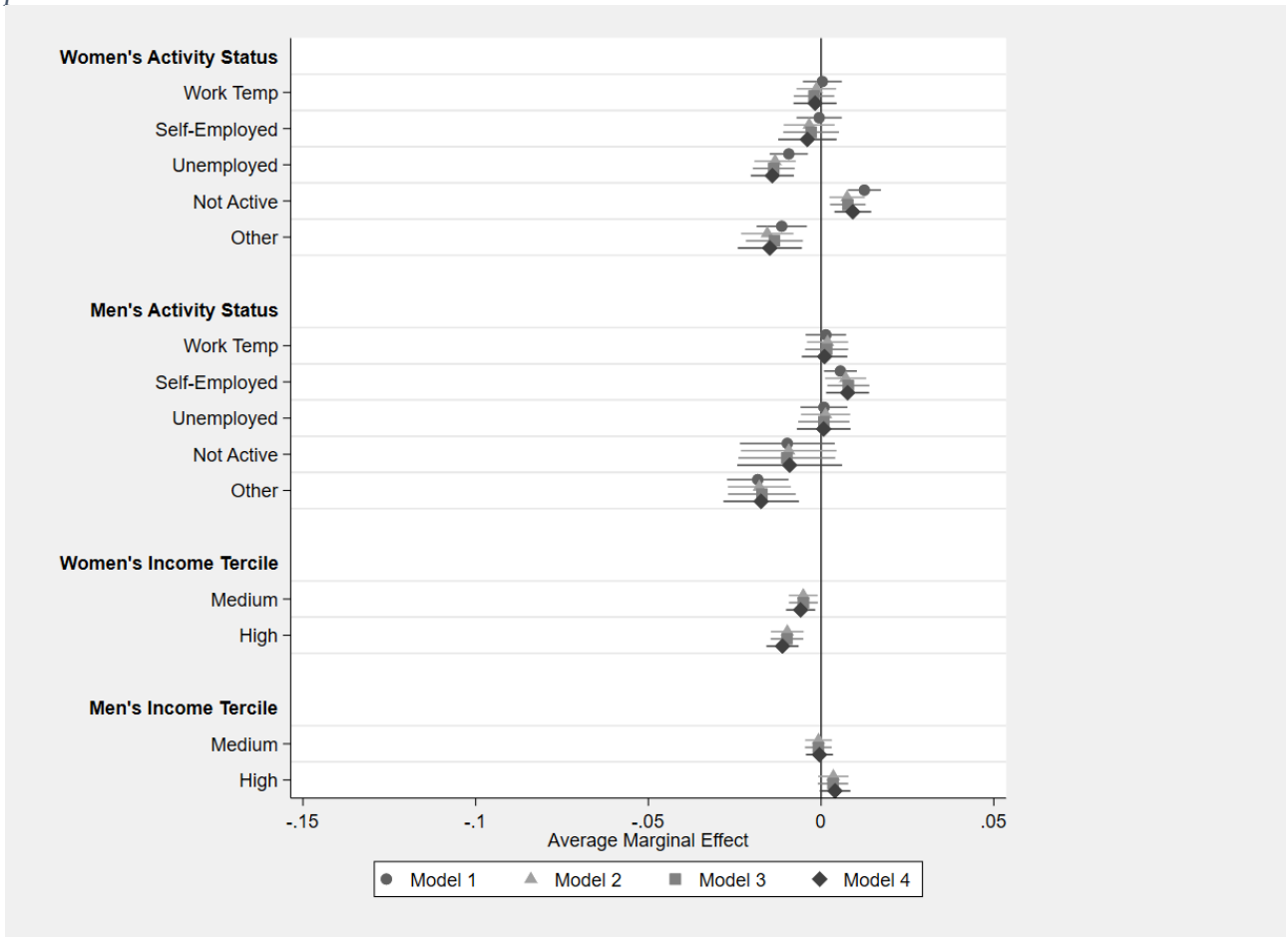
Table 13: (continued)

	Model 1			Model 2			Model 3			Model 4		
	Coef.	**SE**	**AME**	**Coef.**	**SE**	**AME**	**Coef.**	**SE**	**AME**	**Coef.**	**SE**	**AME**
Europe Area and Men's Activity Status Interaction (ref=northern, work permanent)												
Western#Work Temporary										0.182	0.233	
Western#Self-Employed										-0.012	0.162	
Western#Unemployed										0.081	0.247	
Western#Not Active										-0.4	0.483	
Western#Other										-0.205	0.319	
Southern#Work Temporary										0.364	0.255	
Southern#Self-Employed										0.083	0.163	
Southern#Unemployed										0.054	0.268	
Southern#Not Active										-0.022	0.521	
Southern#Other										0.069	0.488	
CEE#Work Temporary										0.099	0.232	
CEE#Self-Employed										-0.018	0.160	
CEE#Unemployed										0.116	0.229	
CEE#Not Active										0.191	0.478	
CEE#Other										0.196	0.313	
Random-Effects Parameter												
var(calendar year)	0.0006	0.0004		0.0005	0.0004		0.0005	0.0004		0.0006	0.0004	
var(intercept)	0.3297	0.1006		0.3312	0.1011		0.3160	0.0971		0.1086	0.0459	
cov(calendar year,intercept)	-0.0114	0.0055		-0.0112	0.0055		-0.0109	0.0054		-0.0067	0.0040	
AIC	37957.7			37944			37995.9			37967.8		
BIC	38318.4			38361.7			38755.3			39097.5		
Couple-Waves	97978			97978			97978			97978		
Couples	49962			49962			49962			49962		
Countries	25			25			25			25		

Source: authors' elaboration on EU-SILC data

*Notes: * p≤0.1, ** 0.01<p≤0.05, *** p≤0.01; Models also include missing categories.*

Figure 11: AMEs coefficients plot for the covariate main activity status and income tercile of both partners



Source: authors' elaboration on EU-SILC data

Looking at the first model specification we can observe the relation between the main activity status of both partners and fertility relative to the conception of the second child. From Model 1 we note, for women, a negative association between the category "unemployed" and the hazard of having the second child in the next year; instead, the category "not active" have a positive association with the hazard. For men we note a positive association between the hazard of having the second child and the category "self-employed".

In the second model we add the variable income of both partners in order to see if the association with hazard and the magnitude of the variable main activity status of women and men change. For women, almost all the values of coefficients increase, only for "not active" category the value decreases. As in the Model 1 the category "unemployed" have a negative effect and the category "not active" a positive effect on the hazard. For men, remain significant only the coefficient of the category "self-employed" with positive value. Moreover, for men, almost all the coefficients display an increase in terms of magnitude. Including the income variable in the model does not mediate the

effect of the main activity status but, if the coefficient result significative, strengthens its relationship with the hazard.

Through the third model we can analyse whether the coefficients of the different interactions between the main activity status variable of both members of couple show a different association with the hazard of having the second child in the following year. In this case we do not observe any significant coefficients for the interaction between the two main activity status. So, for the hazard of having the second child, different working combinations of both members of couple do not seem to have a specific relationship (positive or negative) with the hazard.

From the last model specification, we analyse if the relationship between the hazard and the coefficients of the main activity status variable, for women and men, changes considering the different combinations between the categories of workers and the four macro areas of residence. The model shows that the coefficient for Central and Eastern countries is negative and significant, so for the countries in this macro-area we observe a decrease (respect to Nordic ones) on the hazard. Looking at the interactions between main activity status and macro-area we note that, for men there are no significant coefficients, therefore the combinations of different types of work in different countries do not seem to have a specific relationship with the hazard. Instead for women, we note a positive association with the hazard for those who are self-employed in CEE countries, while the coefficients for the "not active" category in Southern countries and "work temporary" category in Western ones are negative.

Looking at the coefficients of the main activity status variable, in the last model, we observe that for women the sign and the significative of the coefficient for the "not active" category remains stable. Moreover, the category "unemployed" loses significance, while the category "self-employed" seems to have, in this last model, a negative effect on the hazard. For men, instead, almost all the coefficients lose significance and turn negative, except the one for self-employed workers that remains positive even if not significant.

For the other control variables, the models show that: the age of the respondents in the first wave analysed, result positive until 25 for women, then becomes negative. Form men, instead, the coefficients are all negative, except for category "30-35" years old. Partners of higher education are more likely to have another child than partners with low educational levels. The coefficient of the variable "partnership status" result negative and significant in all the models. This confirm, as in the model for the first child, that fertility is higher for married than cohabiting couple.

The four models of Table 5 have similar values of the fit indexes AIC and BIC, with model 2 reaching the lowest value. In order to evaluate the goodness-of-fit, we report in Figure 12 four

calibration plots, one for each model. In addition, to indicate how well the models work together with the graph, we report some statistics: Expected/Observed ratio (E:O), calibration-in-the-large (CITL), calibration slope (Slope) and concordance index (AUC). The statistics reported below are described in paragraph 3.2. To assess if the calibration slope and CITL reach the optimal value of 1 and 0 respectively we make a test at 5% significance level (Table 15). As in the previous case we report also, the Hosmer-Lemeshow test.

Table 14: Goodness-of-Fit statistics

Statistic	Model 1	Model 2	Model 3	Model 4
E:O	1.080	1.081	1.082	1.086
CITL	-0.090	-0.091	-0.092	-0.096
Slope	1.041	1.037	1.025	1.013
AUC	0.823	0.822	0.822	0.821

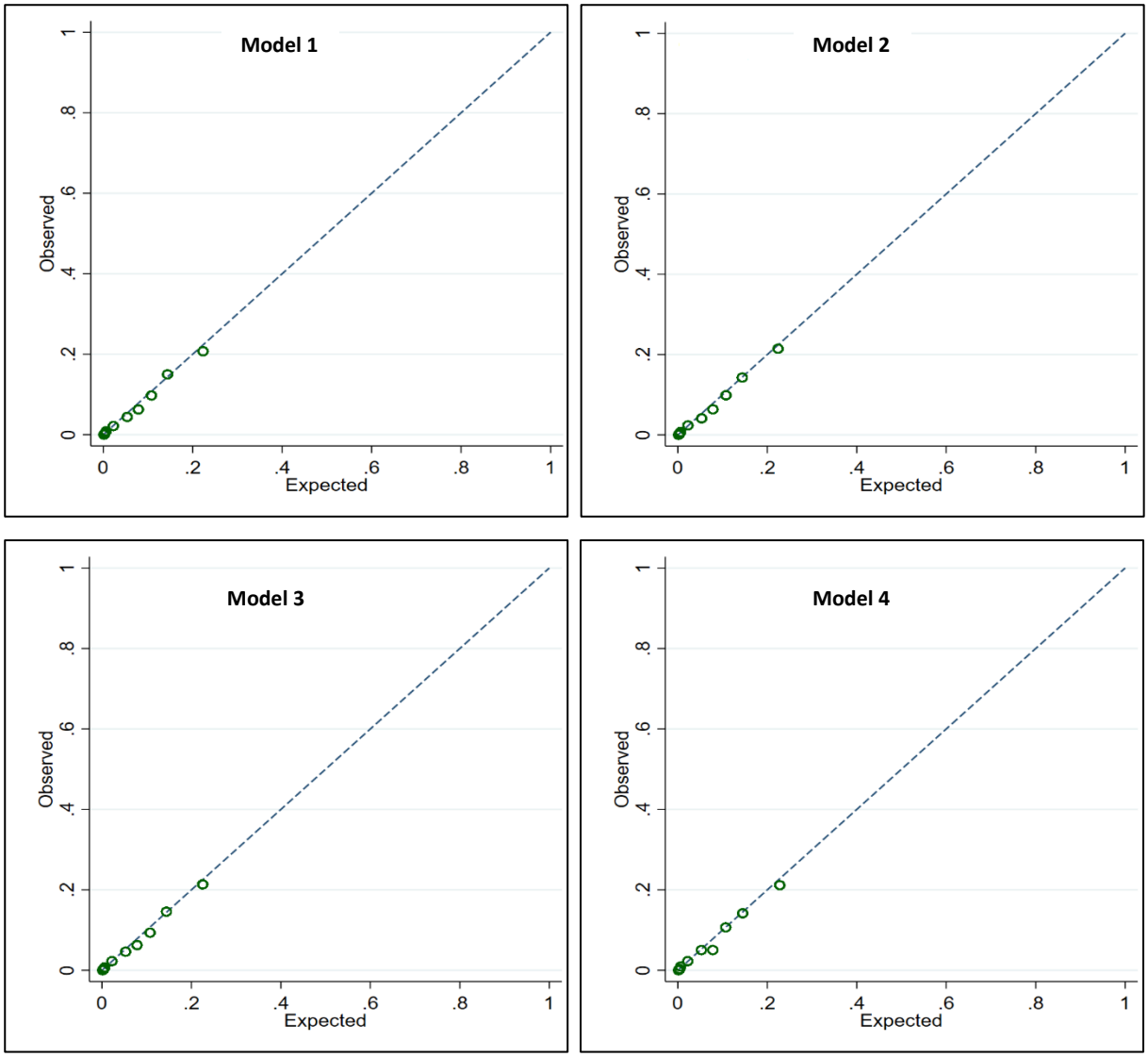
Source: Authors' elaboration on EU-SILC data

Table 15: Goodness-of-Fit tests

Test	Model 1	Model 2	Model 3	Model 4
Hosmer-Lemeshow	0.336	0.435	0.451	0.087
Slope (equal to 1)	0.435	0.482	0.632	0.795
CITL (equal to 0)	0.044	0.042	0.040	0.032

Source: Authors' elaboration on EU-SILC data

Figure 12: Calibration plots for the four model specifications

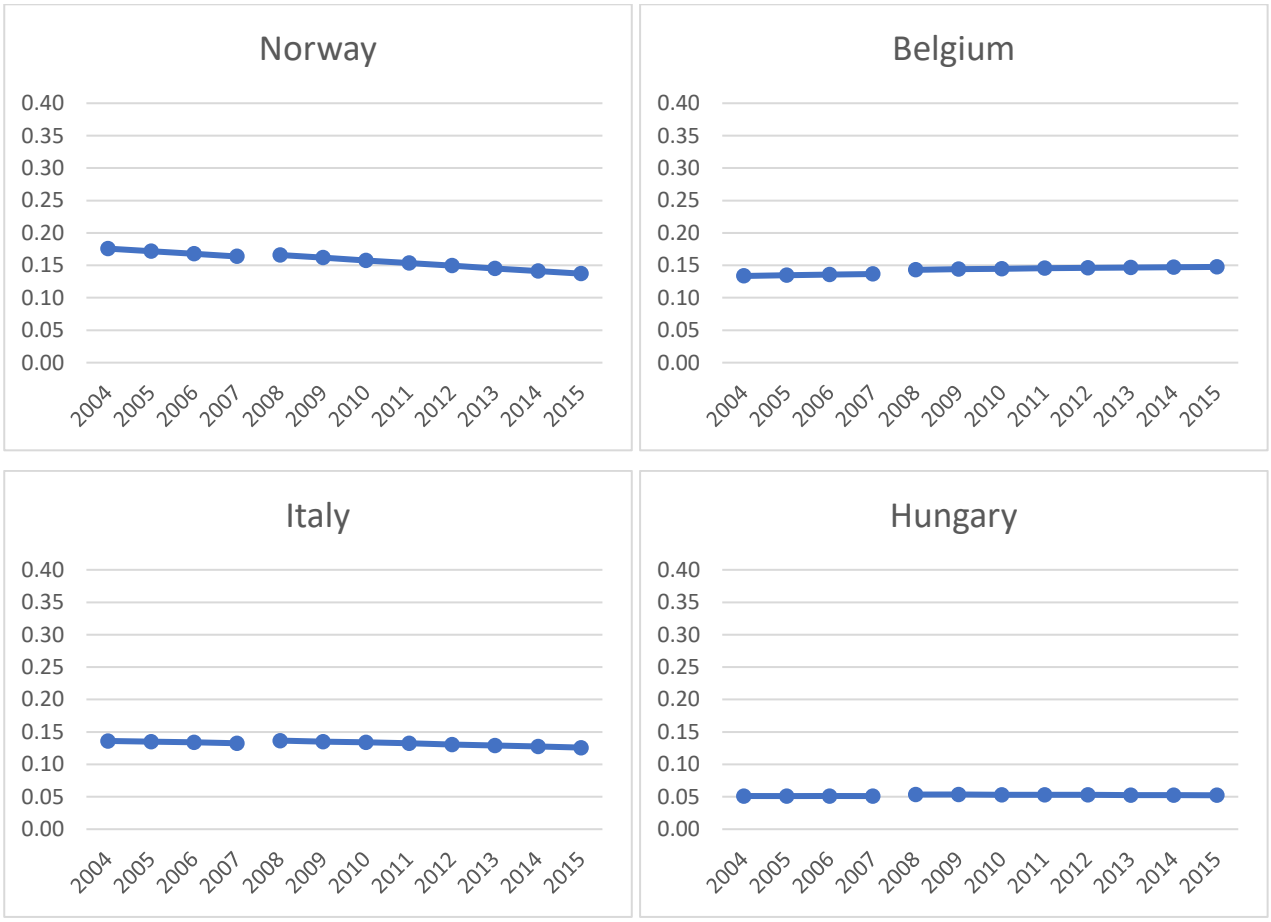


Source: authors' elaboration on EU-SILC data

Table 14, referred to the graphs in Figure 12, shows a value of expected/observed ratio that is around 1.08 in all the four models and the value of CITL that is below -0.1. The calibration slope pass from 1.04 in the first model to 1.01 in the fourth. Moreover, the concordance index is around 0.8. Looking at the Table 15 we observe that the Hosmer-Lemeshow test never rejects the null hypothesis of same proportion of observed and expected across all groups. Furthermore, we note that the test for the equality to one of the calibration slope never reject the null hypothesis, while the p-value of the test for the equality to zero of CITL have a value below 0.05 for all the four models. Finally, if we look at the graphs above, confirming what emerged from the above values, we note that the points that have as abscissa the expected values and as ordinate the observed values lie or are close to the 45° line. Considering the graphs, the tests and the statistics values we can conclude that all the four model specifications have a sufficiently well goodness-of-fit.

In order to see the trend of the predicted hazard in Figure 13 we report the levels of predicted hazard (using model 4), calculated with estimated regression coefficients for the baseline couple (married, both partners 25-30 years, permanent workers, in the lowest tercile of income, low education) and Empirical Bayes estimation of random effects, from 2004 to 2015 for the baseline couple (the discontinuity in the graphs is due to the presence in the models of a dummy variable that is 0 before 2008 and 1 after). For an easy and better visualization of the graphs we show below only one country for each macro-area, since the trend of the hazard is very similar between countries of the same macro-area (the remaining graphs are reported in the appendix, Figure A11).

Figure 13:Predicted hazard to having the second child in the next year for the baseline couple, 2004-2015



Source: author's elaboration on EU-SILC data, using empirical Bayes estimates of random effects

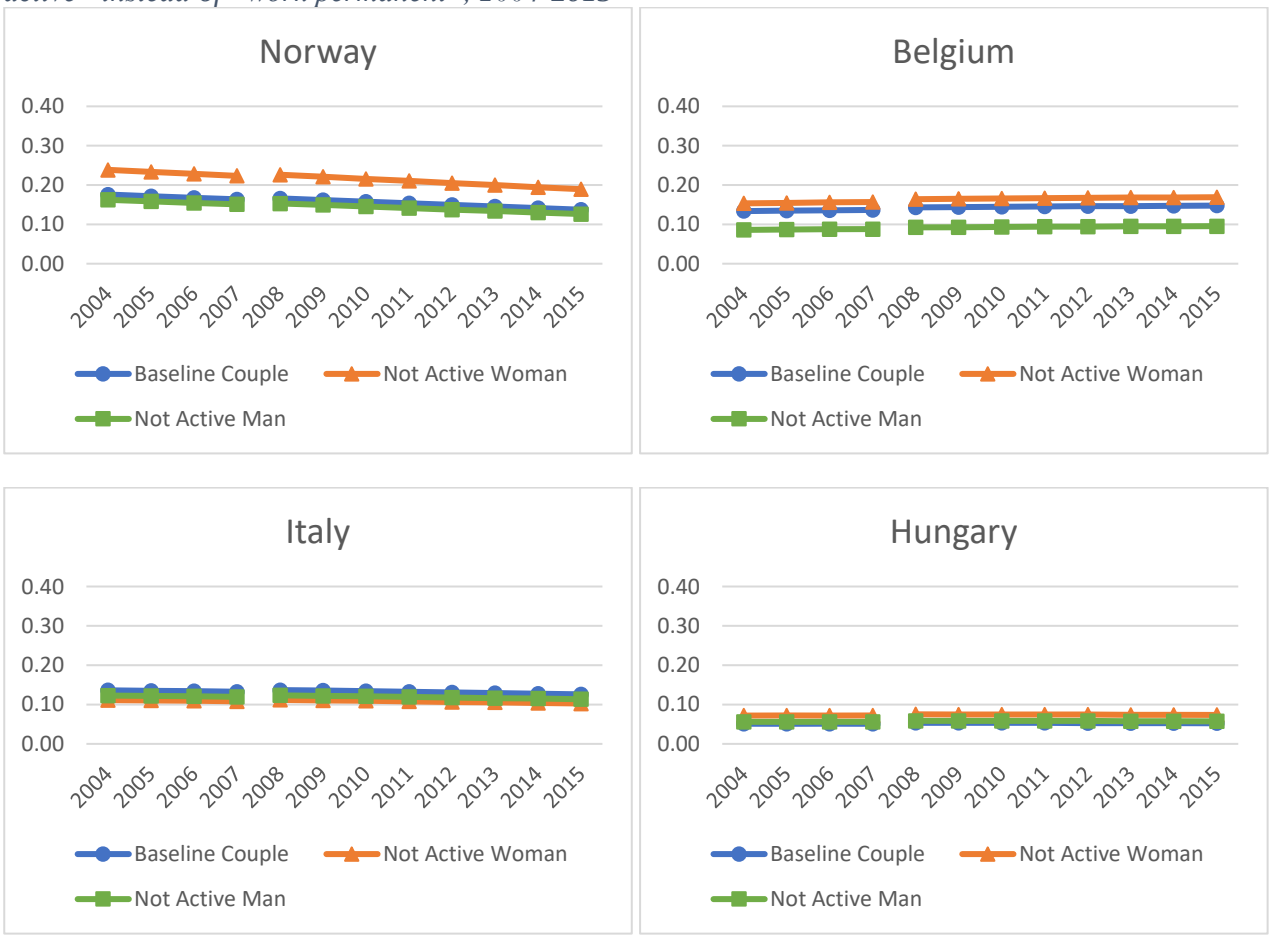
Looking at the graphs above we note that, for Nordic countries the predicted hazard to have the second child in the following year is more stable than what was seen in the case of first child; only Norway and Sweden maintain the decreasing trend. For all the countries, the dummy variable that divide the period before and after 2008 does not highlight a downwards shift of the hazard. Moreover, we observe an increasing trend in the hazard for Austria and Portugal, instead, Switzerland and

Netherland show a decreasing trend (see appendix, Figure A11). For the rest of the Western and Southern countries we observe that the predicted hazard for the baseline couple remained stable along the observation period. Almost all Central and Eastern countries show a stable trend along all the observed year, except Czech Republic, Croatia and Slovenia that display a decreasing trend.

Overall, these graphs seem to show that the hazard of the conception of the second child is less influenced by the start of the Great Recession in 2008. In fact, the decreasing trend that emerged for almost all the countries in the case of the first child, appear only in some countries in the case of second child.

In Figure 14 we report the level of the predicted hazard (using model 4) for the baseline couple (both members of couple are permanent workers) and for couples where the activity status of one of the partners is "not active" instead "work permanent". Since, also in this case, the trend of the hazard is very similar between the countries of the same macro-area, we report only one country as example for each macro-area (the rest of the graphs are reported in the Appendix, Figure A12).

Figure 14: Levels of predicted hazard when the activity status of one of the partners in couple is "not active" instead of "work permanent", 2004-2015



Source: author's elaboration on EU-SILC data, using empirical Bayes estimates of random effects

Differently from what happened for the predicted hazard to have the first child in the following year and net of the general country-specific trend, here, we do not note substantial difference in term of predicted hazard among the three types of couple in Southern and CEE countries. The main differences appear in Northern countries for women and in Western countries for men. In fact, to be not active for women, in Northern countries, led to an increase in the hazard to have the second child in the following year, while in Western countries to be not active for men led to a downward shift of the hazard respect to the baseline couple. In addition to the comparison between the baseline couple and couple where women or men are not active, we report in Figure 15 the comparison between the baseline couple and couple where one member is unemployed. In this case too, only one country per macro-area is reported as example (the rest of the graphs are reported in the Appendix, Figure A13).

Figure 15: Levels of predicted hazard when the activity status of one of the partners in couple is "unemployed" instead of "work permanent", 2004-2015

Source: author's elaboration on EU-SILC data, using empirical Bayes estimates of random effects

The Figure 15 above show that in all the countries, except in Central and Eastern ones where to be unemployed for both women and men does not seem to involve any shift in trend hazard, the predicted hazard trend have a downward shift if the women in the couple is unemployed. So, to be unemployed for women involve a decrease in the hazard of having the second child in the following year. The

hazard, if the man is unemployed in the couple, do not seems to undergo any shift respect to the case of baseline couple in none of the European countries analysed. In general, is the job position of women that involve, in most cases, a decrease in the predicted hazard to have second order births in the next year.

5.3 Detecting the role of the Great Recession

The dummy variable inserted in the models about the conception of second and higher order births did not spotlight a specific effect on the hazard, but the effect of the great recession on high parities could have happened in the years before or after 2008. So, we use structural breaks models to capture these cases by incorporating sudden, permanent changes in the parameters of models. Using the econometric theory of structural break, we can analyse if there is a change in the model parameters, for a specific year, which can be linked to the start of Great Recession.

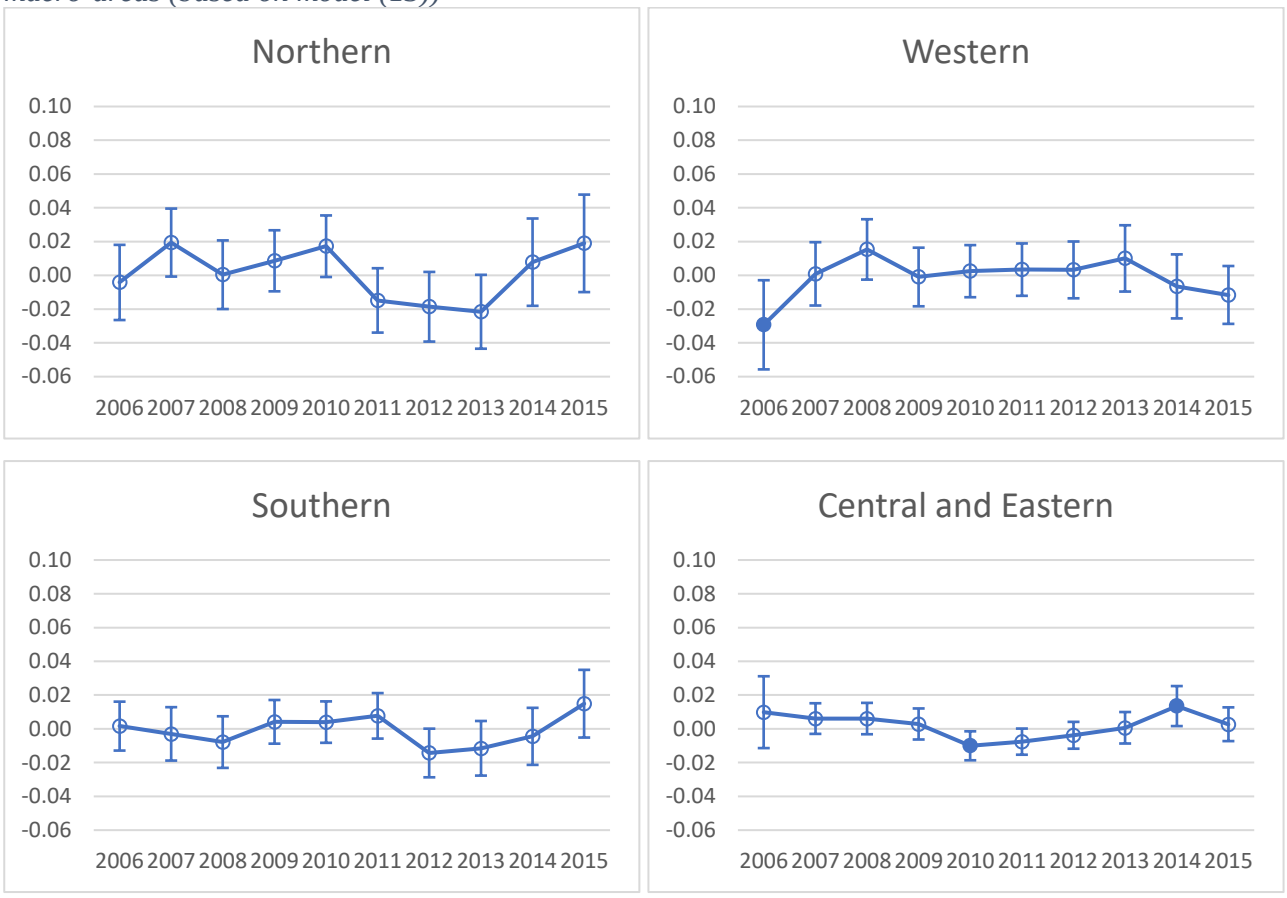
We show in Table 16 the p-value of the Chow test (equation [15]) for years 2006-2015, for each macro-area (North, South, East, West). The tests reported below are described in paragraph 3.3. We provide, in addition, a graph that represent the trends of AME for the values of the dummy year variable. These two tests permit us to verify if there is a change in the slope (Chow test) and/or there is a downward or upward shift.

Table 16: P-value of Chow test (equation (15)) for years 2006-2015 and for each macro-area

Year	North	West	South	East
2006	0.1797	0.1285	0.0479**	0.0609*
2007	0.2290	0.1010	0.2573	0.0463**
2008	0.0912*	0.5355	0.3663	0.0027***
2009	0.1033	0.5885	0.2166	0.0490**
2010	0.0753*	0.8729	0.2180	0.1491
2011	0.1465	0.9848	0.0699**	0.1277
2012	0.0494**	0.6539	0.5964	0.2423
2013	0.0985*	0.2490	0.8259	0.2486
2014	0.0985*	0.7371	0.5182	0.4517
2015	0.2634	0.1216	0.4342	0.0870*

Source: Author elaboration of dataset EU-SILC
*Notes: * $p \leq 0.1$, ** $0.01 < p \leq 0.05$, *** $p \leq 0.01$*

Figure 16: AME and confidence interval for the values of dummy year variable (shift test) for the four macro-areas (based on model (13))



Source: Author elaboration of dataset EU-SILC
Notes: The dot is full if the test is significant ($p \leq 0.05$) and empty if not

The structural breaks analysis does not detect a significant p-value for the Wald test for Northern and Southern countries (Figure 16); hence, we do not observe a negative or positive shift. For Western countries, we find only one significant p-value (considering 0.05 as threshold), for the shift test, that is in 2006; this value is related to a negative shift. Instead for Central and Eastern countries we observe a significant p-value for the Wald test in 2010 and 2014 the shift in these years is positive in 2014 and negative in 2010. If we look at the p-value for the Chow test CEE countries show a change in slope, in 2008, 2009, and 2010 probably because of the Great Recession. Northern countries appear to have structural change also in 2008, as CEE countries, and in 2010 and 2012. For Southern countries, instead, we observe a structural change only in 2011. For Western countries, we do not detect significant p-value for the change in slope (Table 16); so, in these countries there are not slope change in any period observed and the shift change occur only in 2006. In general, all the countries observed, except the Western ones show a structural break after 2008. The Chow test for Southern and CEE countries shows a significant p-value also in 2006.

Considering the results of structural break analysis, we replicate the first two models in Table 13 for each macro-area, choosing the most appropriate dummy in the year where the AME reached the lowest value. Since the number of countries within the four macro-areas is not high enough for a random effects model, fixed effects models are used for the following models. For Northern countries, the trend of the AMEs calculated in the years observed show an up and down trend, although until 2010 the is an increasing tendency. After 2010 the trend decrease reaching is minimum in 2013, after that it increase again. So, for Northern countries we choose the year 2013 that is when the AME reached the lowest value even if the value is not significant.

Table 17: Coefficients of the models and average marginal effect on the hazard for the conception of the second child for Northern countries, 2004-2015

	Model 1			Model 2		
	Coef.	**SE**	**AME**	**Coef.**	**SE**	**AME**
Country						
Denmark	-2.1616***	0.3028		-1.9313***	0.3110	
Finland	-2.204***	0.3030	-0.0027	-1.9399***	0.3137	-0.0006
Iceland	-2.1854***	0.3036	-0.0015	-1.9099***	0.3140	0.0014
Norway	-1.88***	0.2832	0.0203	-1.6332***	0.2924	0.0213
Sweden	-1.643***	0.2997	0.0403	-1.4215***	0.3078	0.0390
Post-2013	-0.3251*	0.1688	-0.0227	-0.3096*	0.1690	-0.0216
Wave (ref=1)						
1	0.1555	0.2145		0.0889	0.2155	
2	0.3414	0.2155	0.0148	0.2642	0.2162	0.0138
3	-0.5489**	0.2370	-0.0417	-0.6157***	0.2376	-0.0416
Women's Age (ref=25-30)						
15-25	0.0554	0.1460	0.0072	0.0308	0.1466	0.0038
30-35	-0.2492***	0.0837	-0.0294	-0.2136**	0.0843	-0.0246
35-40	-0.534***	0.1097	-0.0574	-0.4675***	0.1108	-0.0495
40+	-3.3595***	0.2166	-0.1522	-3.2773***	0.2173	-0.1457
Men's Age (ref=25-30)						
15-25	0.1283	0.2231	0.0100	0.1306	0.2236	0.0102
30-35	0.1069	0.0978	0.0083	0.1017	0.0982	0.0079
35-40	0.0760	0.1139	0.0058	0.0676	0.1144	0.0052
40+	-0.4455***	0.1396	-0.0288	-0.4545***	0.1399	-0.0293
Partnership Status (ref=married)						
Cohabitation	-0.1594**	0.0649	-0.0118	-0.1623**	0.0651	-0.0120
Women's Education (ref=low)						
medium	0.1487	0.1380	0.0095	0.1676	0.1382	0.0104
high	0.4454***	0.1411	0.0314	0.5132***	0.1419	0.0359

Table 17: (continued)

	Model 1			Model 2		
	Coef.	**SE**	**AME**	**Coef.**	**SE**	**AME**
Men's Education (ref=low)						
medium	0.3816***	0.1183	0.0252	0.3823***	0.1189	0.0252
high	0.4349***	0.1260	0.0293	0.4265***	0.1277	0.0286
Women's Activity Status (ref=work permanent)						
Work Temporary	0.1885	0.1529	0.0152	0.1459	0.1536	0.0119
Self-Employed	-0.4677**	0.2137	-0.0306	-0.5882***	0.2216	-0.0382
Unemployed	-0.3106*	0.1863	-0.0214	-0.481**	0.1903	-0.0324
Not Active	0.3006***	0.1142	0.0251	0.1679	0.1182	0.0138
Other	-0.2457*	0.1297	-0.0173	-0.4297***	0.1362	-0.0294
Men's Activity Status (ref=work permanent)						
Work Temporary	-0.0317	0.1799	-0.0024	-0.0389	0.1816	-0.0030
Self-Employed	0.0294	0.1189	0.0023	0.0518	0.1289	0.0041
Unemployed	-0.0874	0.1928	-0.0066	-0.1136	0.1988	-0.0085
Not Active	-0.2410	0.3558	-0.0174	-0.2499	0.3573	-0.0179
Other	-0.5316***	0.1725	-0.0348	-0.5419***	0.1800	-0.0353
Calendar Year (centered on 2008)	-0.0074	0.0153	-0.0002	-0.0035	0.0154	-0.0001
Squared Calendar Year (centered on 2008)	0.0016	0.0050		0.0011	0.0050	
Women's Income Tercile (ref=low)						
Medium				-0.2348***	0.0786	-0.0182
High				-0.443***	0.0925	-0.0322
Men's Income Tercile (ref=low)						
Medium				-0.0445	0.0825	-0.0032
High				0.0759	0.0900	0.0057
AIC	7201.91			7186.8		
BIC	7490			7520.38		
Couples	7852			7852		
Country	5			5		

Source: Authors' elaboration on EU-SILC data
*Notes: * p≤0.1, ** 0.01<p≤0.05, *** p≤0.01; Models also include missing categories.*

Table 17 show that the association between the coefficients of main activity status and the hazard for women is negative for who are self-employed or unemployed and positive for who are not active. For men, instead, although the coefficients are almost all negative only the coefficient of the "other" category is significant. These results are in line with what we saw in Figure 14 and Figure 15 where

we reported the values of predicted hazard for the baseline couple and for couple where one member are in one case not active and in another unemployed. When we control also for the income tercile, for women, the coefficient of the category "not active" of main activity status lose significance, but the other coefficients remain significative with negative value. For men, instead, the coefficients of main activity status continue to be not significant. Only the coefficients of income for women result significative and with negative association with hazard. Differently from the general model, the coefficients of the variable relative to the men's age at the first wave result positive until 40+ years. The other control variables go in the same direction of model that consider all the countries together.

For Western countries, the graph shows an increasing trend until 2008, then the values of AMEs are stable until 2013, after that we observe a slight decrease. In this context the lowest and significant value of the AME is in the first year, so for Western countries we choose the year 2006.

Table 18: Coefficients of the models and average marginal effect on the hazard for the conception of the second child for Western countries, 2004-2015

	Model 1			Model 2		
	Coef.	**SE**	**AME**	**Coef.**	**SE**	**AME**
Country						
Austria	-2.3286***	0.2594		-2.3135***	0.2664	
Belgium	-2.1502***	0.2526	0.0116	-2.1363***	0.2595	0.0115
Switzerland	-1.6221***	0.2848	0.0550	-1.6089***	0.2914	0.0548
France	-2.1045***	0.2378	0.0148	-2.0889***	0.2446	0.0149
Netherland	-1.6111***	0.2643	0.0561	-1.5945***	0.2712	0.0562
United Kingdom	-2.0774***	0.2628	0.0168	-2.0624***	0.2689	0.0168
Post-2010	-0.3451**	0.1481	-0.0286	-0.3527**	0.1483	-0.0293
Wave (ref=1)						
1	0.3301**	0.1541		0.3258**	0.1545	
2	0.6765***	0.1537	0.0274	0.6771***	0.1538	0.0278
3	0.4028**	0.1620	0.0053	0.3999**	0.1621	0.0054
Women's Age (ref=25-30)						
15-25	0.0725	0.1336	0.0086	0.0722	0.1338	0.0085
30-35	-0.0095	0.0679	-0.0011	-0.0018	0.0681	-0.0002
35-40	-0.4204***	0.0870	-0.0422	-0.4101***	0.0873	-0.0411
40+	-2.7899***	0.1542	-0.1307	-2.7794***	0.1544	-0.1298
Men's Age (ref=25-30)						
15-25	-0.3228	0.2100	-0.0254	-0.3246	0.2103	-0.0255
30-35	-0.0001	0.0815	0.0000	0.0063	0.0818	0.0005
35-40	-0.1054	0.0927	-0.0089	-0.1021	0.0933	-0.0086
40+	-0.7919***	0.1109	-0.0535	-0.7896***	0.1116	-0.0532
Partnership Status (ref=married)						
Cohabitation	-0.1154**	0.0543	-0.0086	-0.114**	0.0544	-0.0085

Table 18: (continued)

	Model 1			Model 2		
	Coef.	**SE**	**AME**	**Coef.**	**SE**	**AME**
Women's Education (ref=low)						
medium	0.1787*	0.0998	0.0115	0.1834*	0.1003	0.0117
high	0.5436***	0.1043	0.0396	0.5716***	0.1066	0.0417
Men's Education (ref=low)						
medium	0.1766**	0.0898	0.0121	0.1819**	0.0900	0.0125
high	0.3584***	0.0948	0.0262	0.3721***	0.0975	0.0272
Women's Activity Status (ref=work permanent)						
Work Temporary	-0.2063**	0.1040	-0.0146	-0.223**	0.1056	-0.0157
Self-Employed	-0.2004	0.1375	-0.0142	-0.1924	0.1554	-0.0137
Unemployed	-0.2026	0.1315	-0.0143	-0.2181	0.1368	-0.0154
Not Active	0.2795***	0.0732	0.0230	0.2739***	0.0839	0.0226
Other	-0.584***	0.1982	-0.0364	-0.5934***	0.2035	-0.0369
Men's Activity Status (ref=work permanent)						
Work Temporary	0.0893	0.1097	0.0068	0.0829	0.1115	0.0063
Self-Employed	0.0781	0.0888	0.0059	0.0696	0.1070	0.0053
Unemployed	0.0759	0.1354	0.0058	0.0591	0.1396	0.0045
Not Active	-0.4906	0.3080	-0.0309	-0.5124*	0.3103	-0.0321
Other	-0.5651**	0.2515	-0.0347	-0.5889**	0.2546	-0.0359
Calendar Year (centered on 2008)	0.0125	0.0200	-0.0004	0.0145	0.0201	-0.0003
Squared Calendar Year (centered on 2008)	-0.0042	0.0036		-0.0043	0.0036	
Women's Income Tercile (ref=low)						
Medium				0.0409	0.0740	0.0031
High				-0.0637	0.0794	-0.0047
Men's Income Tercile (ref=low)						
Medium				-0.0479	0.0673	-0.0036
High				-0.0279	0.0757	-0.0021
AIC	10975.8			10984.4		
BIC	11294.9			11351.4		
Couples	10901			10901		
Country	6			6		

Source: Authors' elaboration on EU-SILC data
*Notes: * p≤0.1, ** 0.01<p≤0.05, *** p≤0.01; Models also include missing categories.*

The Model 1 in Table 18 shows that for women the association between the main activity status category “work temporary” and the hazard is negative instead the association between the category “not active” and the hazard to have another child in the following year is positive, both these coefficients are significative. For men, none of the coefficients relating to the main activity status are significant, except that of the category “other”. Adding to the model the income variables it emerges that, for women both the coefficients of "not active" and “work temporary” categories remain significant with a positive and negative values respectively; for men the coefficient of "not active" category becomes significant with negative value. The coefficients of income variables are not significant in either of the two models. In general, the other control variables go in the same direction of general model.

For Southern countries, the trend of the AMEs is stable until 2011, after that we observe a slight decrease in 2012 follow by a new increase until the end of the observed period. Since, from the graph we observe that, after a period of stability in term of the value of the AME there is a negative downturn in 2012, we use this year as dummy to insert in the two models.

Table 19: Coefficients of the models and average marginal effect on the hazard for the conception of the second child for Southern countries, 2004-2015

	Model 1			Model 2		
	Coef.	**SE**	**AME**	**Coef.**	**SE**	**AME**
Country						
Greece	-2.7433***	0.2062		-2.8031***	0.2445	
Italy	-2.6197***	0.1955	0.0059	-2.6909***	0.2356	0.0053
Portugal	-3.3528***	0.2552	-0.0216	-3.4193***	0.2854	-0.0219
Post-2012	-0.3059*	0.1706	-0.0138	-0.3184*	0.1707	-0.0143
Wave (ref=1)						
1	0.5316***	0.1139		0.4944***	0.1202	
2	0.594***	0.1173	0.0031	0.5926***	0.1173	0.0049
Women's Age (ref=25-30)						
15-25	0.0655	0.1875	0.0069	0.0717	0.1880	0.0077
30-35	-0.2833***	0.0991	-0.0264	-0.2924***	0.0994	-0.0274
35-40	-0.6417***	0.1147	-0.0524	-0.6567***	0.1152	-0.0538
40+	-3.0183***	0.1803	-0.1132	-3.0387***	0.1809	-0.1147
Men's Age (ref=25-30)						
150-25	-0.1884	0.4280	-0.0074	-0.2017	0.4280	-0.0079
30-35	0.2117	0.1501	0.0098	0.2152	0.1505	0.0100
35-40	0.2603*	0.1570	0.0123	0.2633*	0.1575	0.0124
40+	-0.0633	0.1703	-0.0026	-0.0602	0.1708	-0.0025
Partnership Status (ref=married)						
Cohabitation	-0.2875**	0.1208	-0.0124	-0.2925**	0.1209	-0.0126

Table 19: (continued)

	Model 1			Model 2		
	Coef.	**SE**	**AME**	**Coef.**	**SE**	**AME**
Women's Education (ref=low)						
medium	0.0595	0.0893	0.0026	0.0420	0.0898	0.0018
high	0.4442***	0.1134	0.0226	0.4071***	0.1152	0.0206
Men's Education (ref=low)						
medium	0.0999	0.0815	0.0045	0.0839	0.0822	0.0038
high	0.2963***	0.1137	0.0146	0.2538**	0.1165	0.0124
Women's Activity Status (ref=work permanent)						
Work Temporary	-0.0012	0.1238	-0.0001	0.0481	0.1281	0.0023
Self-Employed	-0.0569	0.1122	-0.0028	0.0917	0.1514	0.0045
Unemployed	-0.3532***	0.1241	-0.0155	-0.2242	0.1435	-0.0097
Not Active	-0.1213	0.0870	-0.0058	0.0165	0.1227	0.0008
Other	-0.1060	0.3255	-0.0051	0.0227	0.3364	0.0011
Men's Activity Status (ref=work permanent)						
Work Temporary	0.2339*	0.1254	0.0115	0.2447*	0.1300	0.0121
Self-Employed	0.165**	0.0782	0.0079	0.1748	0.1220	0.0084
Unemployed	-0.0179	0.1612	-0.0008	-0.0330	0.1755	-0.0015
Not Active	-0.1128	0.3348	-0.0048	-0.1222	0.3398	-0.0052
Other	-0.3630	0.4233	-0.0141	-0.3977	0.4296	-0.0152
Calendar Year (centered on 2008)	0.0232	0.0187	0.0016	0.0249	0.0188	0.0017
Squared Calendar Year (centered on 2008)	0.0039	0.0046		0.0040	0.0046	
Women's Income Tercile (ref=low)						
Medium				0.0891	0.1085	0.0040
High				0.2204*	0.1285	0.0105
Men's Income Tercile (ref=low)						
Medium				-0.1344	0.1095	-0.0062
High				0.0306	0.1189	0.0015
AIC	6945.38			6949.74		
BIC	7221.06			7272.68		
Couples	10076			10076		
Country	3			3		

Source: Authors' elaboration on EU-SILC data
*Notes: * p≤0.1, ** 0.01<p≤0.05, *** p≤0.01; Models also include missing categories.*

For women in Southern countries results that the association between the category "unemployed" and the hazard to have another child in the next year is negative. For men, instead, emerge a positive association between the hazard and the categories "work temporary" and "self-employed", the association between hazard and the category "work temporary" remains positive and significant also if we control for the income (Model 2). Only the coefficient of the income variable relative to the high category is significant and with positive value for women. Differently from the general model the category "35-40" of the variable "men's age" results positive. The other control variables, instead, go in the same direction of general model.

Finally, for Central and Eastern countries, we select the 2010 year that is the one with the lowest and significant value of AME.

Table 20: Coefficients of the models and average marginal effect on the hazard for the conception of the second child for Central and Eastern countries, 2004-2015

	Model 1			Model 2		
	Coef.	**SE**	**AME**	**Coef.**	**SE**	**AME**
Country						
Bulgaria	-2.9638***	0.7401		-2.8513***	0.7433	
Czech Republic	-2.0899***	0.7536	0.0303	-1.9666***	0.7569	0.0308
Estonia	-2.2893***	0.7550	0.0213	-2.1895***	0.7584	0.0208
Croatia	-1.9911***	0.7662	0.0352	-1.8705**	0.7699	0.0356
Hungary	-2.5927***	0.7540	0.0102	-2.4775***	0.7575	0.0103
Lithuania	-2.895***	0.7632	0.0017	-2.8168***	0.7658	0.0008
Latvia	-2.449***	0.7544	0.0151	-2.3541***	0.7576	0.0145
Polonia	-2.381***	0.7523	0.0177	-2.2541***	0.7558	0.0183
Serbia	-2.7156***	0.7796	0.0065	-2.6141***	0.7830	0.0062
Slovenia	-1.8336**	0.7608	0.0439	-1.7462**	0.7640	0.0424
Slovak Republic	-2.6024***	0.7609	0.0099	-2.4967***	0.7636	0.0097
Post-2010	-0.2454**	0.1070	-0.0098	-0.2528**	0.1070	-0.0100
Wave (ref=1)						
1	0.0026	0.7392		0.0087	0.7400	
2	-0.0846	0.7396	-0.0038	-0.0750	0.7404	-0.0037
3	-1.3461*	0.7447	-0.0364	-1.3465*	0.7455	-0.0364
Women's Age (ref=25-30)						
15-25	0.2564***	0.0974	0.0177	0.245**	0.0976	0.0166
30-35	-0.0369	0.0656	-0.0023	-0.0312	0.0658	-0.0019
35-40	-0.6672***	0.0952	-0.0317	-0.6498***	0.0955	-0.0307
40+	-3.3666***	0.2008	-0.0660	-3.335***	0.2010	-0.0651
Men's Age (ref=25-30)						
15-25	-0.0106	0.1398	-0.0004	0.0048	0.1400	0.0002
30-35	0.0236	0.0732	0.0010	0.0136	0.0734	0.0006
35-40	-0.1469*	0.0885	-0.0059	-0.1552*	0.0887	-0.0062
40+	-0.5405***	0.1158	-0.0185	-0.5477***	0.1159	-0.0187

Table 20: (continued)

	Model 1			Model 2		
	Coef.	**SE**	**AME**	**Coef.**	**SE**	**AME**
Partnership Status (ref=married)						
Cohabitation	-0.2821***	0.0664	-0.0103	-0.2761***	0.0665	-0.0101
Women's Education (ref=low)						
medium	0.0949	0.1054	0.0033	0.1067	0.1055	0.0036
high	0.4084***	0.1170	0.0160	0.447***	0.1180	0.0175
Men's Education (ref=low)						
medium	-0.0634	0.0924	-0.0024	-0.0741	0.0928	-0.0028
high	0.1987*	0.1080	0.0083	0.1658	0.1101	0.0069
Women's Activity Status (ref=work permanent)						
Work Temporary	0.1134	0.0962	0.0042	0.0615	0.0975	0.0024
Self-Employed	0.2358*	0.1235	0.0093	0.1228	0.1367	0.0049
Unemployed	-0.0912	0.0968	-0.0031	-0.2556**	0.1062	-0.0088
Not Active	0.3628***	0.0659	0.0150	0.1958**	0.0789	0.0080
Other	-0.0635	0.1800	-0.0022	-0.2441	0.1863	-0.0084
Men's Activity Status (ref=work permanent)						
Work Temporary	-0.0879	0.0911	-0.0033	-0.0643	0.0919	-0.0024
Self-Employed	0.0782	0.0823	0.0032	0.1420	0.1002	0.0058
Unemployed	0.0082	0.1022	0.0003	0.0747	0.1081	0.0030
Not Active	0.0440	0.2952	0.0018	0.1040	0.2979	0.0042
Other	-0.2028	0.2418	-0.0073	-0.1138	0.2464	-0.0042
Calendar Year (centered on 2008)	0.0709**	0.0308	0.0022	0.0705**	0.0309	0.0022
Squared Calendar Year (centered on 2008)	-0.0025	0.0038		-0.0025	0.0038	
Women's Income Tercile (ref=low)						
Medium				-0.2088***	0.0709	-0.0084
High				-0.339***	0.0843	-0.0130
Men's Income Tercile (ref=low)						
Medium				0.0928	0.0713	0.0034
High				0.1976**	0.0776	0.0077
AIC	12637.1			12624.6		
BIC	13026.7			13066.1		
Couples	21133			21133		
Country	11			11		

Source: Authors' elaboration on EU-SILC data
*Notes: * p≤0.1, ** 0.01<p≤0.05, *** p≤0.01; Models also include missing categories.*

Table 20 shows that, for women the main activity status categories “self-employed” and “not active” have a positive association with the hazard, while all the categories for men are not significant. When we control for the income variables of both members of couple the coefficient of the category “self-employed for women loses significance. In the second model remains the coefficient of the category “not active” with positive value and becomes significant the coefficient of the category “unemployed” with negative association with the hazard. For men, instead, all the coefficients of main activity status remain not significant. Moreover, the coefficients of women’s income variable result to have both a negative value, instead for men, only the coefficient relative to the category high result significant and with positive value. So, women that have high income, probably are more career oriented and then, in this case, substitution effect dominates income effect. For CEE countries, as in other cases, the other control variables go in the same direction of general model. Using four different fixed effects models for each macro-area it is possible to evaluate whether the influence of some covariates on the hazard of first conception varies with respect to the general model. Differently from what happens in the case of the conception of the first child, from the four previous models, differences emerge with respect to the general models only on covariates that were not significant. In particular, for Western countries there is a negative coefficient on the "work temporary" category for women. In the Southern countries, on the other hand, the only difference concerns the men’s age "35-40" category which appears to have a positive coefficient. Finally, for CEE countries, only in the first model (without the covariate concerning the income tercile) emerges a positive coefficient of the "self-employed" category for women. So, in the case of the conception of the second child, no substantial differences emerge with respect to the models carried out separately for the four macro-areas and the general model where all the countries are analysed jointly.

Concluding Discussion

The expansion of temporary job contracts has raised concern that these jobs may constitute an additional source of insecurity and precariousness for workers and their families. In this study we focused on the link between economic uncertainty (using employment instability as indicator) and fertility in contemporary Europe considering the characteristics of both partners jointly. The empirical analysis of this study focused on European countries during the years 2004-2015.

The data we used appear to have a complex structure. In fact, the dataset has a nested structure; couples are followed for several years and each couple belongs to a different country. Given the differences between European countries, couples within the same country may exhibit a more similar behaviour, in terms of fertility, than couples from different countries. Multi-level models have been used which are a means to investigating complex between-place and between people differences. Moreover, they provide a way of explicitly modelling heterogeneity. We use, specifically, a multilevel discrete-time hazard model with random slope and intercept. The random slope, used to model the heterogeneity between countries, refers to the calendar year, so that each country has its own trajectory. Through these models we answer to key research questions regarding the influence of main activity status and work characteristics on fertility and about the possible mediation role of income on the link between activity status and fertility. Having the information of both partners, it is possible through the use of multilevel models to analyse if there is an effect of the gender-specific combination of partners' activity status on fertility and if the different welfare and labour market regimes moderate the effect of partners' activity status on fertility. The use of these multilevel models on a large dataset containing several information is of considerable importance, as it allows to capture any differences that exist in the fertility behaviour of couples, using the characteristics of both partners jointly, between the different European countries but also within the same country. Moreover, according to the different goodness-of-fit measures taken into consideration, the fit of these models results satisfactory.

First, we analysed *how and how much partners' main activity status and work characteristics influence fertility*. In general, it emerged that alternative job typologies for either partners depress fertility, especially for women. Therefore, permanent occupations for both partners are associated with higher fertility. Moreover, observing the graphs representing predicted hazard curve by country, we noted different scenarios across Europe. Comparing baseline couple with those in which one of the partners is not active instead permanent worker we noted interesting differences between countries. We observed that for Nordic countries alternative job typologies of either partners lead to a decrease in the hazard of having the first child, especially if the man is not active. Conversely, in

Southern countries, if the woman is not active it emerged a positive association with the hazard of conception; while if the man is not active the association remains negative. In fact, we noted, for both not active men and women in Southern countries, a positive association with the hazard of conception of first child. This is because, as compared with the reference category of Northern countries, in Southern ones be not active turns out to be less detrimental to the hazard of having the first child in the next year. These latest findings suggested that the decision to have the first child is influenced not only by the partners' own characteristics but also by the country specific degree of support for combining work and family.

Then we evaluated if *income variable mediates the association between partners' activity status and couples' fertility*. We observed that, the negative association between activity status and fertility is less strong and significant when we also considered the income variable. Therefore, we can assert that the income effect mediates the activity status effect, but despite this mediation the relation between partners' activity status and fertility persists. In general, higher income of both couple members is related to an increase in the hazard of having the first child.

Afterwards we analysed if *there is an effect of the gender-specific combination of partners' activity status and work characteristics on fertility*. The results confirmed what emerged previously, or that permanent occupation of both partners turns out to be the one with the greater hazard of having the first child in the next year. In addition, we noted that the combination of main activity status and work characteristics where the woman is self-employed, and the man is unemployed involves a decrease in the hazard of conception. Moreover, we can observe that different activity status characteristics combinations of partners in a couple influence the decision to have first child, especially if the man is not a permanent worker.

The decline in fertility in Europe has been imputed to several factors, including the welfare regime (Reher 1998; Esping-Andersen 1999), low levels of state support for childcare (Fent, Diaz, Fürnkranz-Prskawetz 2013), difficulties faced by women in balancing work and family life (McDonald 2000). So, evaluated also if *the welfare and labour market regimes moderate the effect of partners' activity status and work characteristics on fertility*. We found a negative association with the hazard of conception of the first child for the Southern and CEE countries, that are those with more rigid labour market arrangement and more conservative gender labour division. So, in these countries, the hazard to have the first child is less than in Northern countries (reference category). Furthermore, different activity status in different European areas lead to different associations with the hazard. In fact, is found an increase in the hazard of conception of the first child if the woman is unemployed or not active in Southern and CEE countries, while for men the increase in the hazard is

found for the categories temporary workers and self-employed. Overall, we can assert that couples in different welfare regimes takes different decision about the right moment to have a first child considering also, the job of the woman, the man and both jointly.

In a part of the dissertation, we considered the conception of the second child to evaluate *on which transition the effect of the main activity status and work characteristics of the members of the couple is stronger*. In terms of main activity status and work characteristics, for the conception of the second child, we found a negative association with hazard of "unemployed" category and a positive relation for "not active" category, for women. Instead for men the association between hazard of having the second child in the next year and the coefficients of category "self-employed" results positive. Differently from what happened for the first child in the case of the transition to the second one the income variable seems not to mediate the activity status variables. In general, to be in the categories medium or high income is related to a decrease in the hazard for women with respect to the reference category (low income); instead, for men only the category of high income showed a positive association with the hazard of conception of the second child. Finally, considering the combinations between main activity status and macro-area of residence, it emerged a negative association between hazard of conception of the second child and the categories "work temporary" in Western countries and "not active" in Southern ones, for women. For CEE countries, instead, emerged a positive association between category "self-employed" and hazard of the conception of second child. The results of the predicted hazard for different type of couple showed distinct scenarios across Europe. In particular, in Northern and Western countries the couple where the woman is not active presents an increase in the hazard of the conception of the second child, while in Western countries if the man is not active the hazard decreases. In couples where the woman is unemployed the hazard of the conception results lower than the baseline couple in all the countries, even if in the CEE the decrease is very small. So, for the conception of second child seems more detrimental the unemployed status for women than for men. Comparing the result obtained for the conception of the first child, and the one obtained for the conception of the second we noted that, the effect of the main activity status and work characteristics variable results important both in the case of the first and the second child, but in the latter case the association between the hazard of conception and the activity status variable is not mediated by other variables.

Then, we used the structural break analysis to evaluate if *the Great Recession influenced the couple dynamics leading to the birth of child*. This analysis revealed that the Great Recession have an impact on conception of first child in almost all the European countries. In fact, for Northern and Southern countries, we observed a positive shift change until 2008, then the trend became negative

due to the impact of the Great Recession on these countries. In the years 2009-2011 a significant p-value comes up, in term of structural change, for all the European countries, except Western ones. In general, in the years immediately after the onset of the crisis, numerous significant changes are observed, both in terms of shift and in terms of slope (structural breaks), these results suggest that the Great Recession has somehow influenced the conception of first child.

Using the results of the structural breaks analysis we also evaluated if there are some difference in the association between the hazard of conception of the first child and the variables: women's and men's main activity status, partnership status, level of education, age at the beginning of the observation period, and income tercile. For all the macro-areas of residence (Northern, Western, Southern, and CEE) no differences emerged from previous results in which all countries were considered jointly. For women, the income variable resulted to mediate the activity status effect in Northern, Western and CEE countries. In Southern countries, instead, the income variable leads to a change in the relation of coefficients of the categories "self-employed" and "not active" with hazard of conception of the first child, in fact these values become positive. Differently, for men, the income variable does not seem to mediate the activity status effect in almost all European countries.

Finally, we repeated the structural break analysis also in the case of second child; even in this case, we found an influence of the Great Recession. In fact, for Southern and CEE countries, we observed a negative shift after 2008. Moreover, in these countries, in 2009 and 2010 is present also a structural break. For Southern and CEE countries the structural break emerges also in 2006 and 2007. In general, after the onset of the crisis there are numerous changes both in term of shift and slope, these finding suggest that the Great Recession has an influence on couples' fertility at all parities. In the case of the second child, we noted that, for women, in almost all European countries a positive association between the category "not active" and the hazard to have the second child in the next year comes up. Moreover, in Northern, CEE and Southern countries there is also a negative relation between the women who are unemployed and the hazard. Instead, the category "self-employed" presents a negative association with the hazard in Northern countries and a positive association in CEE ones. For men, we observed a positive association of the categories "work temporary" and "self-employed" with the hazard of the conception of the second child in Southern countries, and a negative association for the category "not active" in Northern ones. This means that in Southern countries to be a temporary worker or self-employed, for men, is associated with an increase in the hazard to have the second child in the next year, while in Northern countries to be not active leads to a decrease in the hazard. Moreover, the association between the hazard of the conception of the second child and the income variable, is positive for the category "high" in CEE countries, for men and in Southern

ones, for women. For women in Northern and Central and Eastern countries this association is negative both for "medium" and "high" categories, this may mean that women with higher income, probably are more career oriented and so substitution effect dominates income effect.

Our study has some limitations, which can be the starting point for future investigation on this topic. First, in our models there can be an endogeneity problem due to joint determination between activity status and fertility. Decide to get out of the labour market or to reduce labour participation (i.e. by temporary contracts) may be jointly determined by fertility behaviour, as well as the decision to enter the labour market, especially for women. In fact, women more career oriented may decide to have fewer (or no) children, and these women may be overrepresented in the labour force (Agüero and Marks 2008). Conversely, women more family oriented may select themselves in temporary employment or get out of the labour market. The joint determination may result from the existence of norms and values (or preferences) concerning the attachment to labour force participation and to family building (Hakim, 2002), and the extent to which the roles of parent and worker are difficult to combine. Second, distinguishing between voluntary and involuntary employment conditions is crucial for a better understanding of the consequences of temporary and uncertain forms of employment on parenthood. In fact, for some occupations – depending, in part, on the prestige of a given job – short-term contracts, or dispatch work, are the norm and are not perceived as heightening uncertainty (Vignoli, Mencarini and Alderotti 2020). Third, we do not distinguish between the ways in which temporary employment influences fertility indirectly through union formation and directly within unions. For instance, because temporary employment reflects a partnership sorting mechanism, men with precarious jobs are more likely not to be in a union (Vignoli, Tocchioni and Salvini 2016). A simultaneous consideration of patterns of union formation and parenthood in relation to employment uncertainty would be an interesting topic for future research. Fourth, couples who are in the risk set for higher order births may be a non-random selection of couples (Adsera 2011). Supposing that the decision to have another child depends on the strength of childbearing intentions and income opportunity costs, the couples who have had a first child are expected to be selective. On the one hand couples with one child have stronger childbearing intentions than the couples who have not had first child. On the other hand, the fact that the couple have had the first child indicates that the preconditions for having the first child were fulfilled. These factors may positively affect the progression to higher order births (Wood, Neels and Vergauwen 2016). At the same time, we do not have to deal with the confounding influence of the "normative parental imperative" (Rindfuss, Morgan and Swicegood 1988), according to which every adult member of a society should became

parent, because the couple that we observed for the transition to higher order parities have already had the first child.

Overall, this study analysed the link between economic uncertainty, using labour market uncertainty as indicator, and fertility. Our results suggested, in general, that the activity status of the partners plays an important role in the couples' choice fertility behaviour, especially in the case of first conception. In particular, from the models come up that job typologies different from permanent employment depress fertility, especially for women. Moreover, the association between activity status and the hazard of first conception remains, even if less strong when we control also for partners' income tercile. Looking at the different influences of main activity status of both partners in each European country, interesting results emerge for the Northern and Southern countries. In fact, for women, to be not active leads to a negative association with hazard of conception in Nordic countries and to a positive association in Southern ones for the conception of first child, instead to be not active for men leads to a decrease in the hazard of conception both in Nordic and Southern countries. In the case of the second child, on the other hand, it is found that the main influence on the hazard of conception is due to the women's main activity status. Looking at this relationship in each country, it can be seen that being unemployed (rather than not active as in the case of the first child) leads to a decrease in the conception hazard in almost all European countries. Our analyses also show that (especially in the case of the first child) the Great Recession has influenced fertility behaviour in almost all European countries.

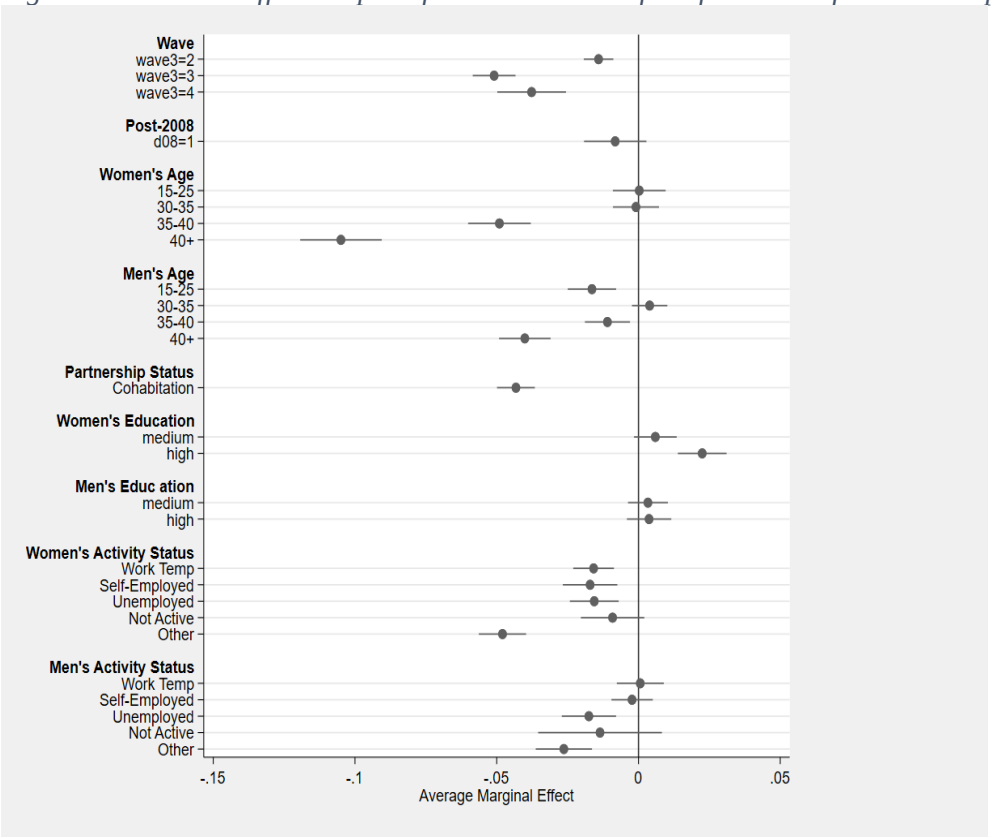
This dissertation contributes to deepen the knowledge of the relationship between economic uncertainty and fertility in Europe. In this context, the results obtained, using a dataset that contains information from different European countries, help to better explain how the economic crisis that has occurred in recent years has influenced fertility behaviour in Europe. Furthermore, most of the previous studies mainly considered the characteristics of the woman or at least two separate models for men and women. Therefore, these models did not take into account the fact that the decision to have a child is made on the basis of the work and economic characteristics of both partners and that is why in this study the unit of analysis is the couple-waves. In fact, to evaluate the relationship between economic uncertainty and fertility in more depth, we consider not only the characteristics of a partner but those of both jointly in the study of the influence of employment uncertainty on fertility. Employment uncertainty has become an intrinsic feature of the globalizing world, and its effects on fertility are a major research topic. We evaluate this relationship also in light of the income variable, because the decision to have a child may depend not only on the current employment but also on the household disposable income. Moreover, this research, using structural breaks analysis contributes to

a better understanding of the influence that the Great Recession has had on fertility intentions in couples, in different European countries.

We believe that this analysis provides important information about the link between employment uncertainty (used as proxy of economic uncertainty) and fertility, by verifying how and with what magnitude precarious employments affect couples' fertility intentions, in a European context. In general, the conclusions that emerge from this research on the link between employment uncertainty and fertility should also spur further research on the topic. In particular, using the EU-SILC panel dataset, a first direct extension of this work is to consider birth parities higher than the first two. In this way we can analyse the influence of the crisis on the couple's choice to have the n-child. Subject to the availability of a panel dataset containing, for all countries, the information regarding the region of residence of the couples, it would be possible to extend the study considering an additional level in the models. Using also the regional level it would be possible to take into account not only the heterogeneity between the different European countries but also the heterogeneity present between the different regions of the same country. Furthermore, no information is available in our dataset regarding the possible voluntary nature of the employment condition. In fact, for some types of work, short-term contracts, or dispatch work are the norm therefore they are not perceived as uncertain (particularly if they refer to top-level professions). Besides if fixed-term work is voluntary, this can improve job satisfaction and quality of life. So, having available the information regarding whether the employment conditions are voluntary or involuntary, we could improve our models considering this further distinction in the main activity status and work characteristics. Moreover, our research does not take into account the indirect influence that union formation has on fertility. In general, for many people a stable union is still considered a precursor to the birth of a child, in fact, generally union dissolution reduces opportunities for conceiving and bearing children. So, declines in union formation and union stability have made it more difficult for individuals to give birth to a child. Although childbearing in cohabiting unions or out of unions has increased in many European countries, fertility rates remain much higher in marriage than in cohabitation and in cohabitation than during periods without a coresident partner. Given this close connection between union formation and fertility, a further interesting research topic should be a simultaneous consideration of patterns of union formation and parenthood in relation also to employment uncertainty.

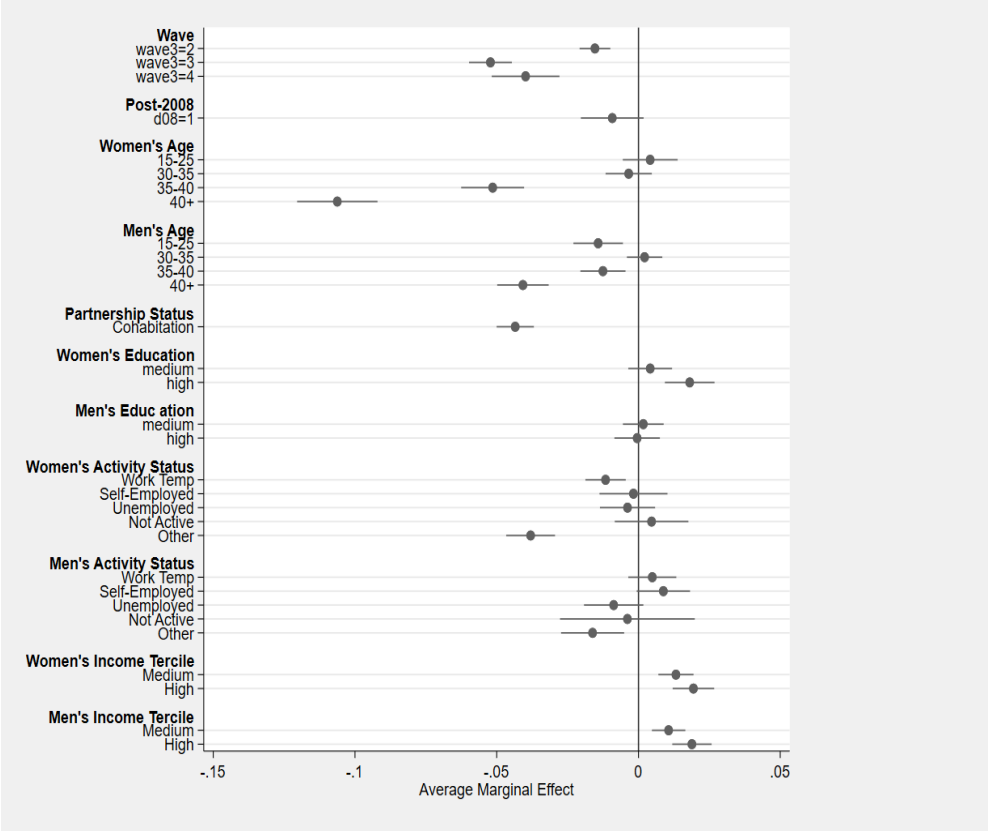
Appendix

Figure A1: AMEs coefficients plots for the covariate of the first model for the conception of the first child



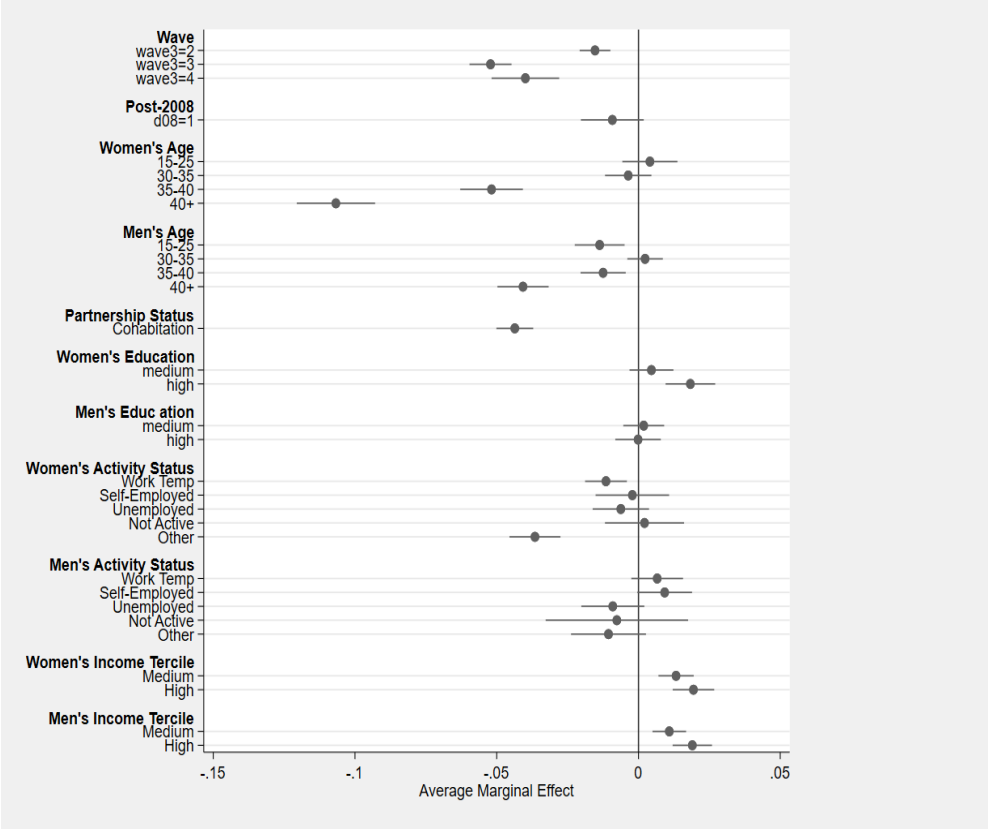
Source: Authors' elaboration on EU-SILC data

Figure A2: AMEs coefficients plots for the covariate of the second model for the conception of the first child



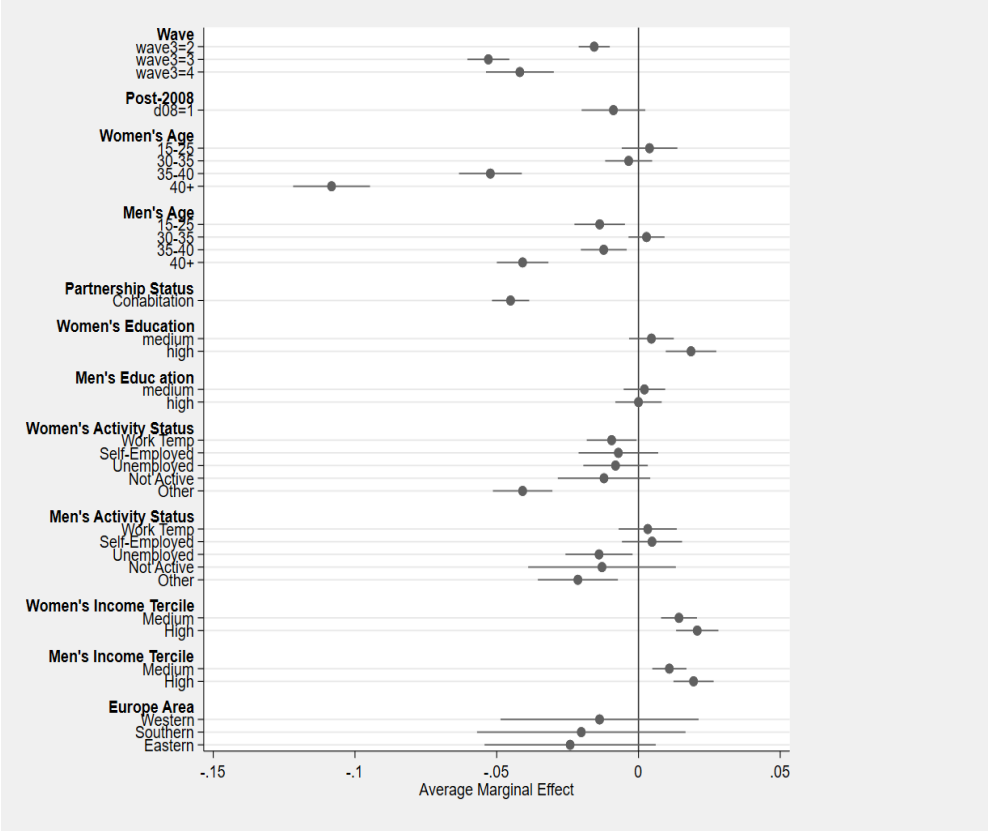
Source: Authors' elaboration on EU-SILC data

Figure A3: AMEs coefficients plots for the covariate of the third model for the conception of the first child



Source: Authors' elaboration on EU-SILC data

Figure A4: AMEs coefficients plots for the covariate of the fourth model for the conception of the first child



Source: Authors' elaboration on EU-SILC data

Figure A5: Predicted hazard to having the first child in the next year for the baseline couple, 2004-2015

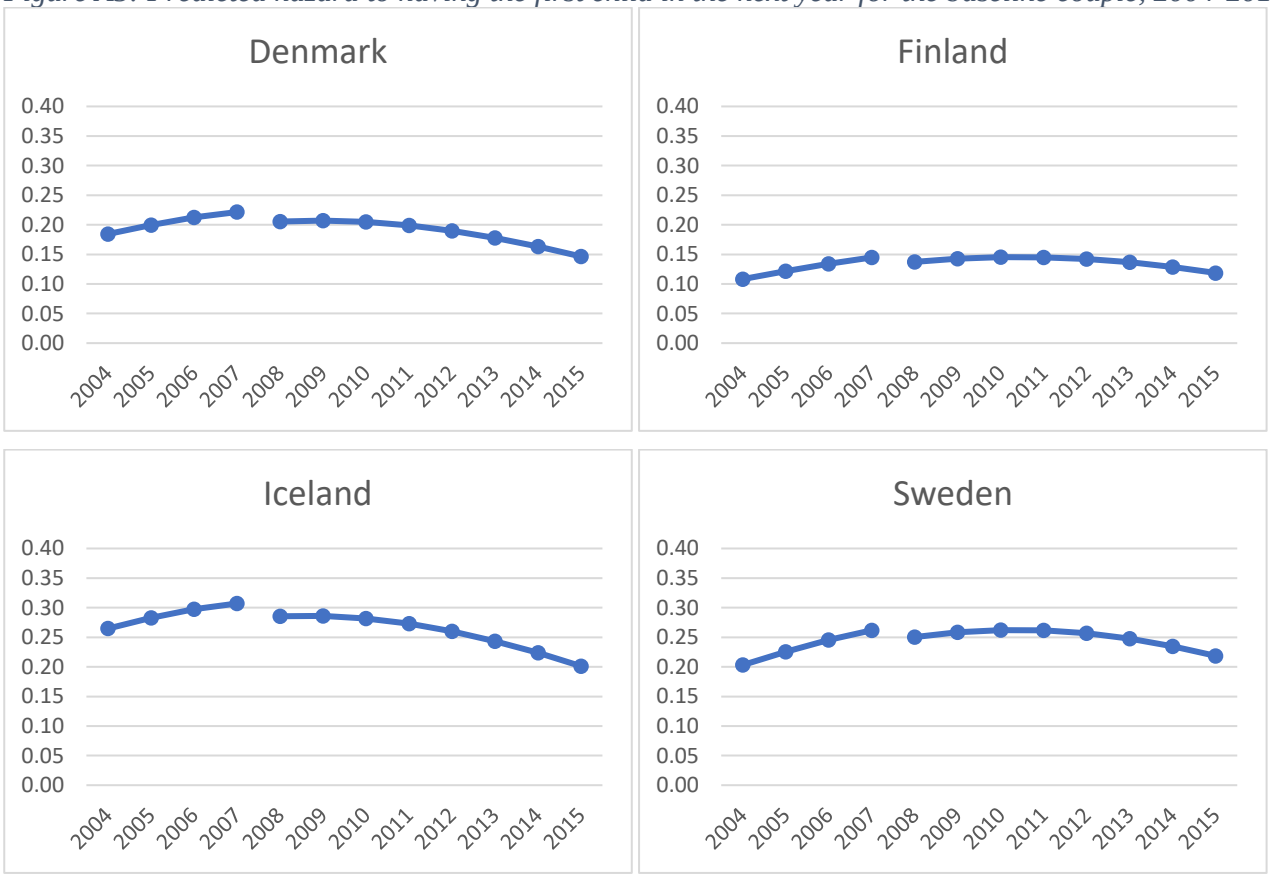
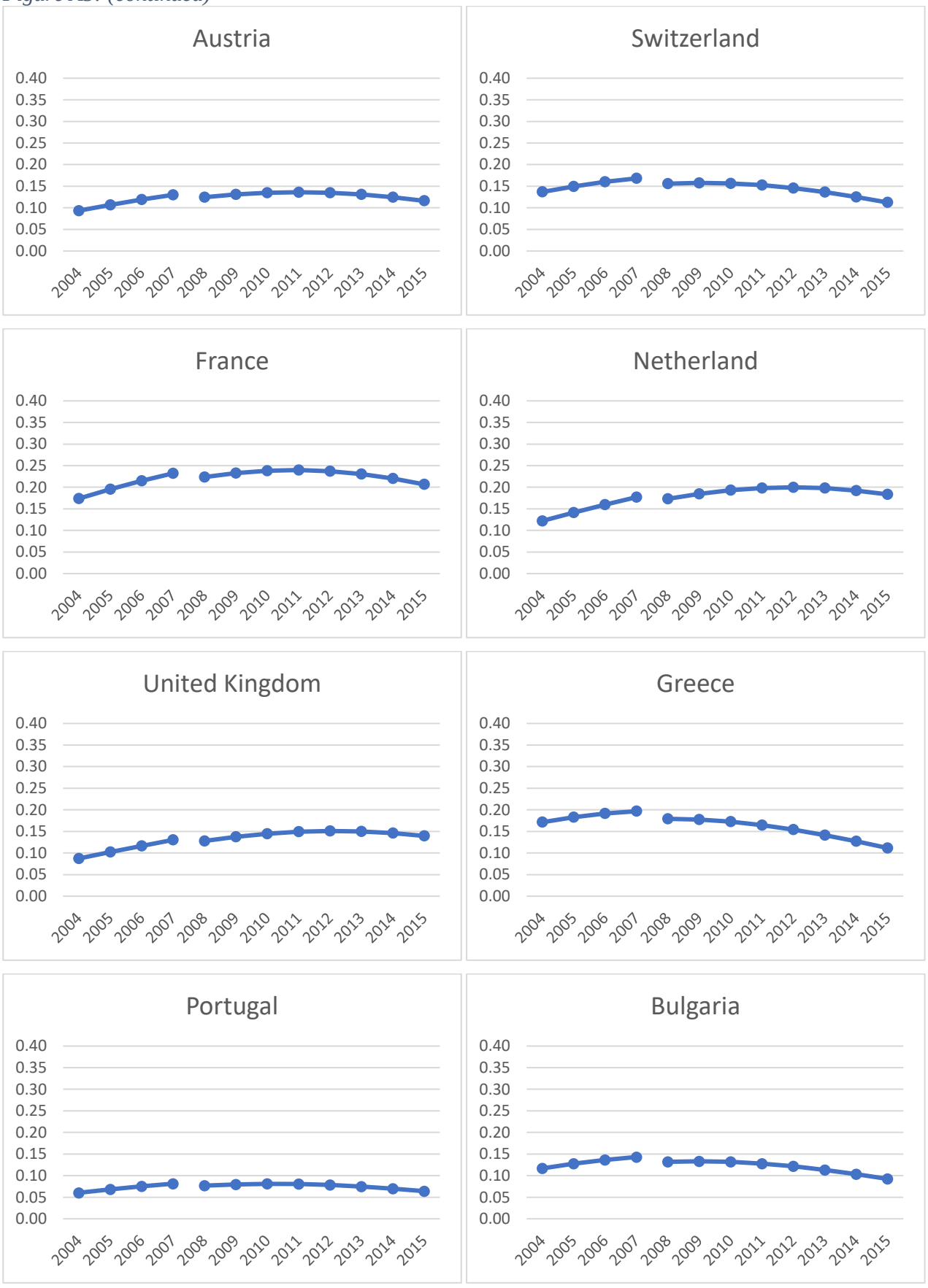


Figure A5: (continued)



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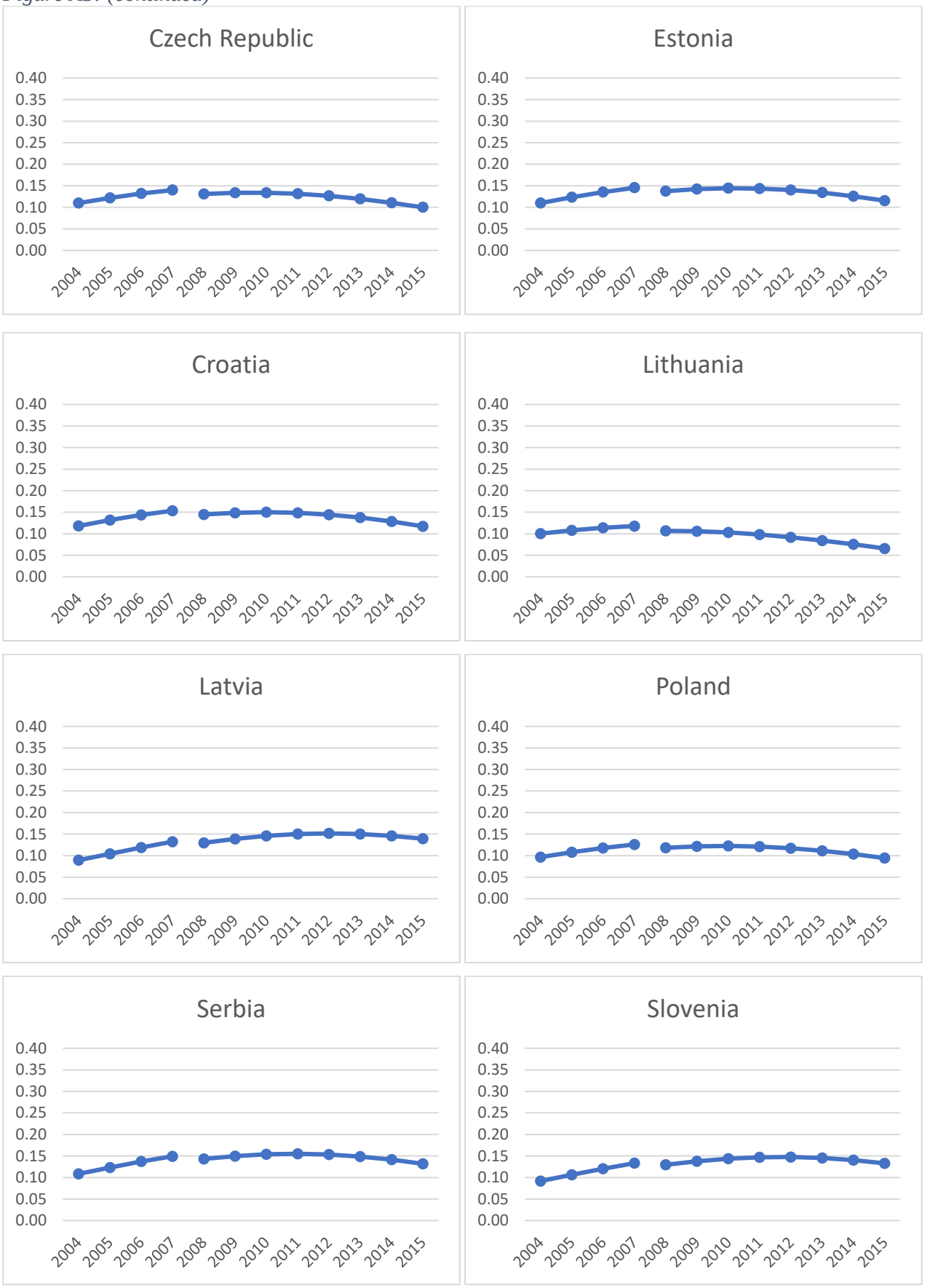
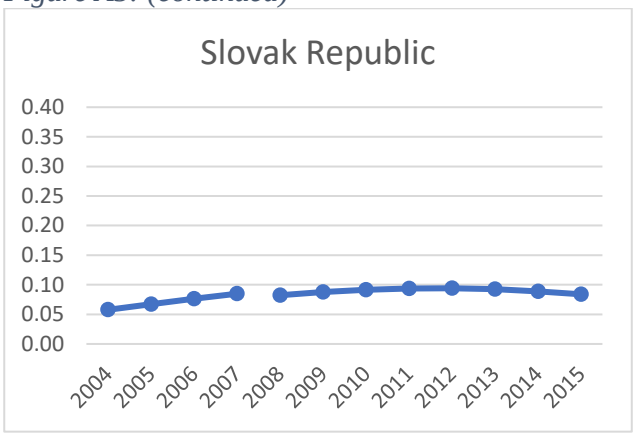


Figure A5: (continued)



Source: Authors' elaboration on EU-SILC data

Figure A6: Levels of predicted hazard when the activity status of one of the partners in couple is "not active" instead of "work permanent", 2004-2015 (conception of first child)

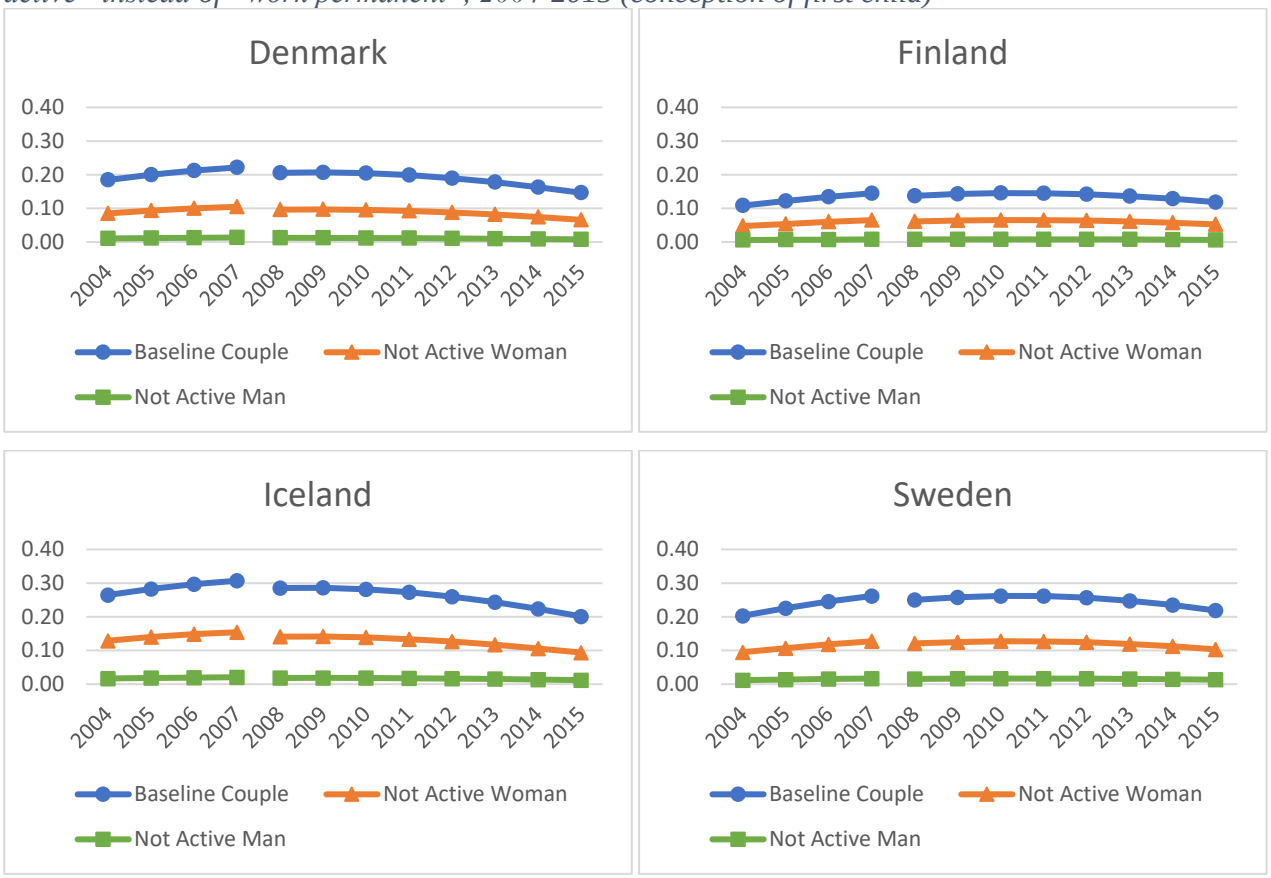


Figure A6: (continued)

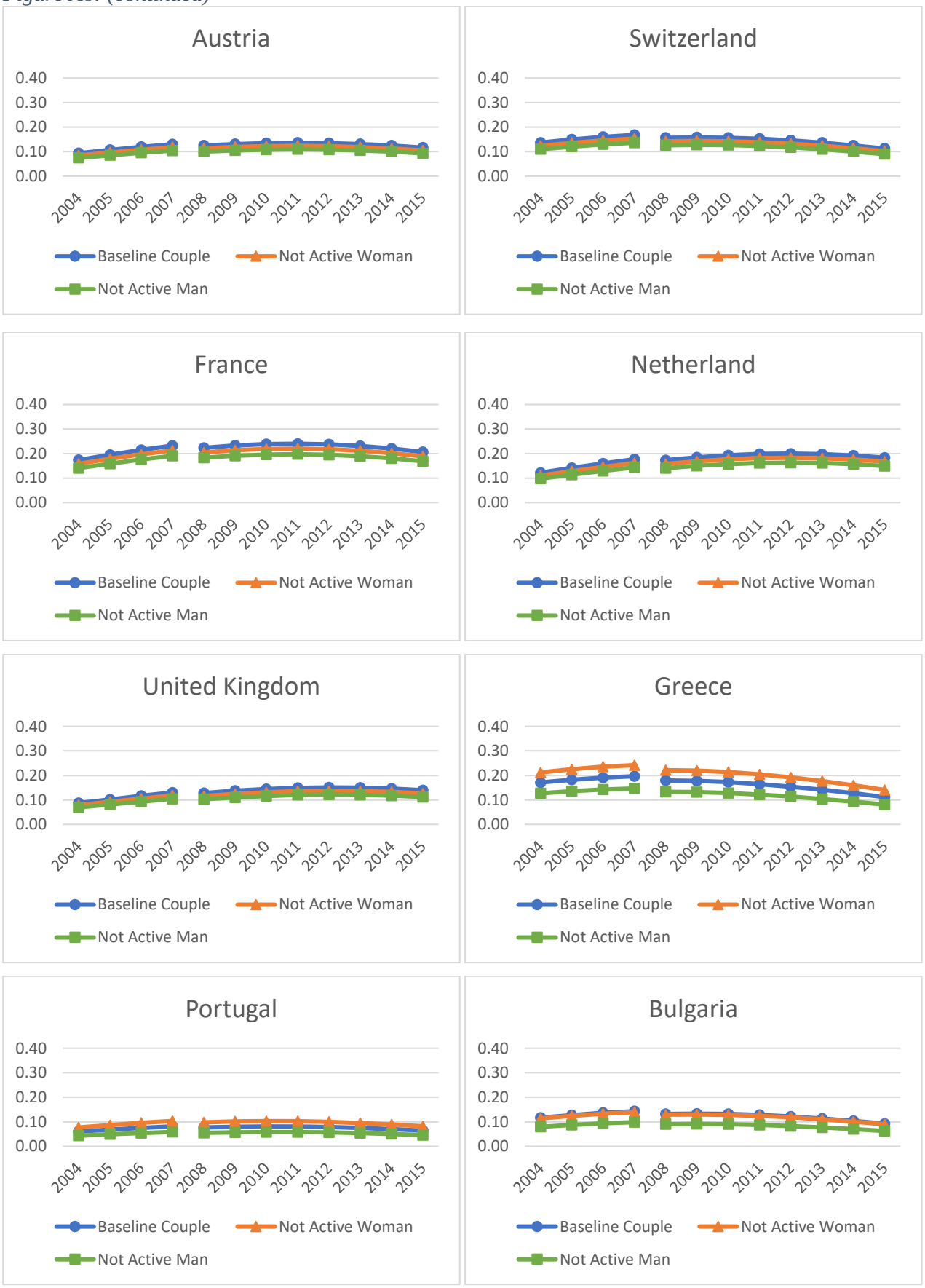
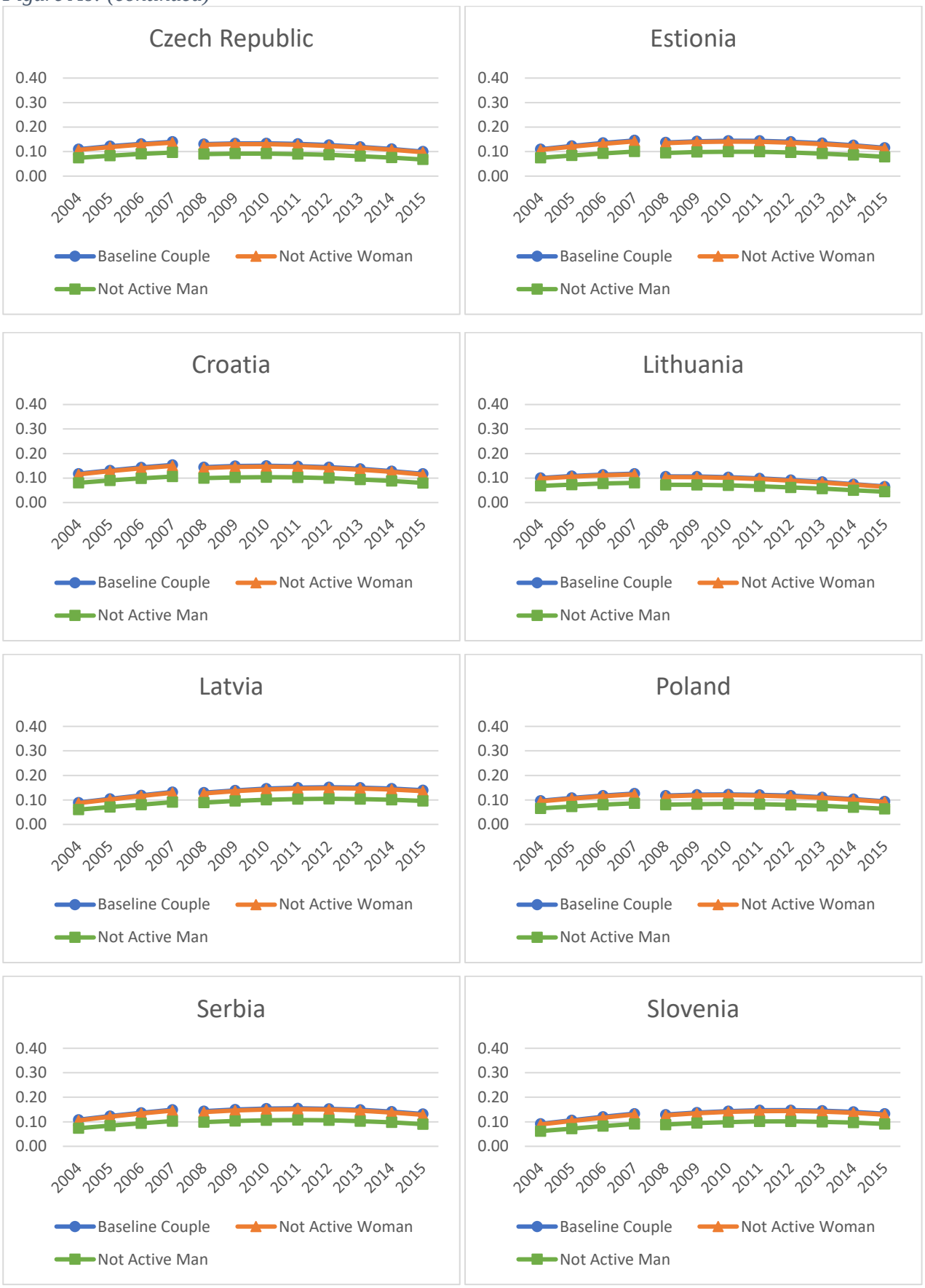


Figure A6: (continued)



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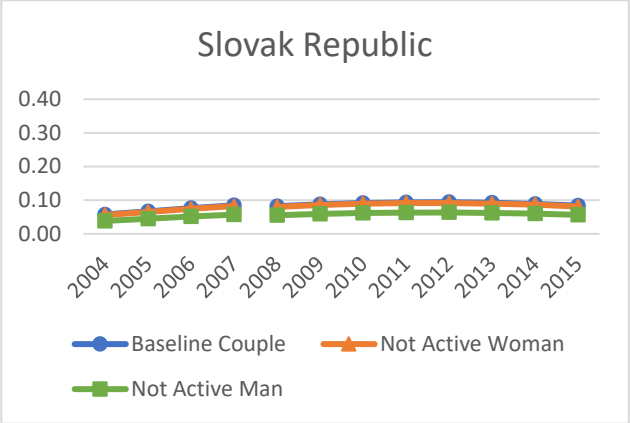
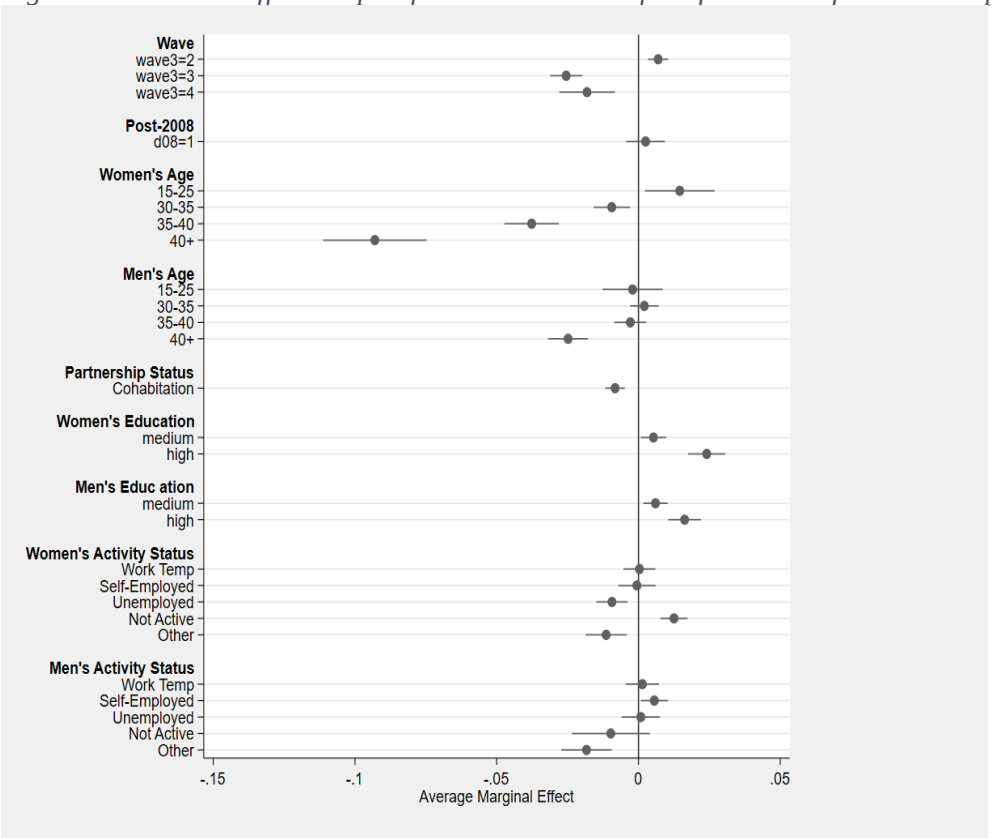


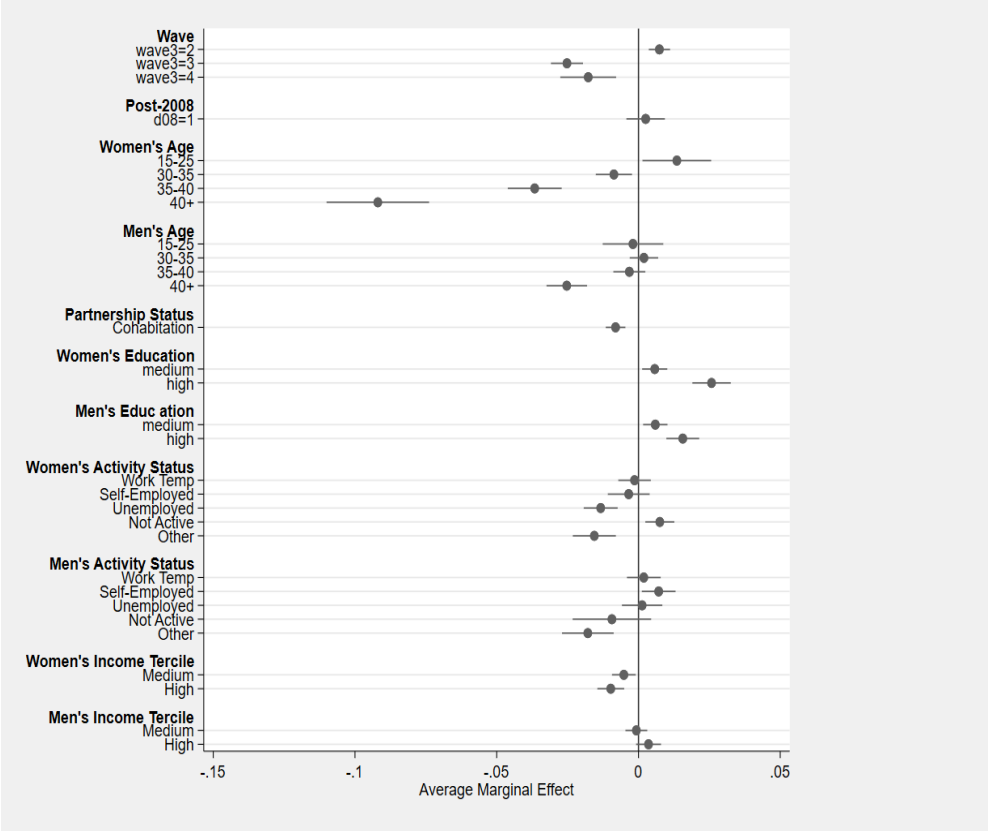
Source: Authors' elaboration on EU-SILC data

Figure A7: AMEs coefficients plot for the covariates of the first model for the conception of the second child



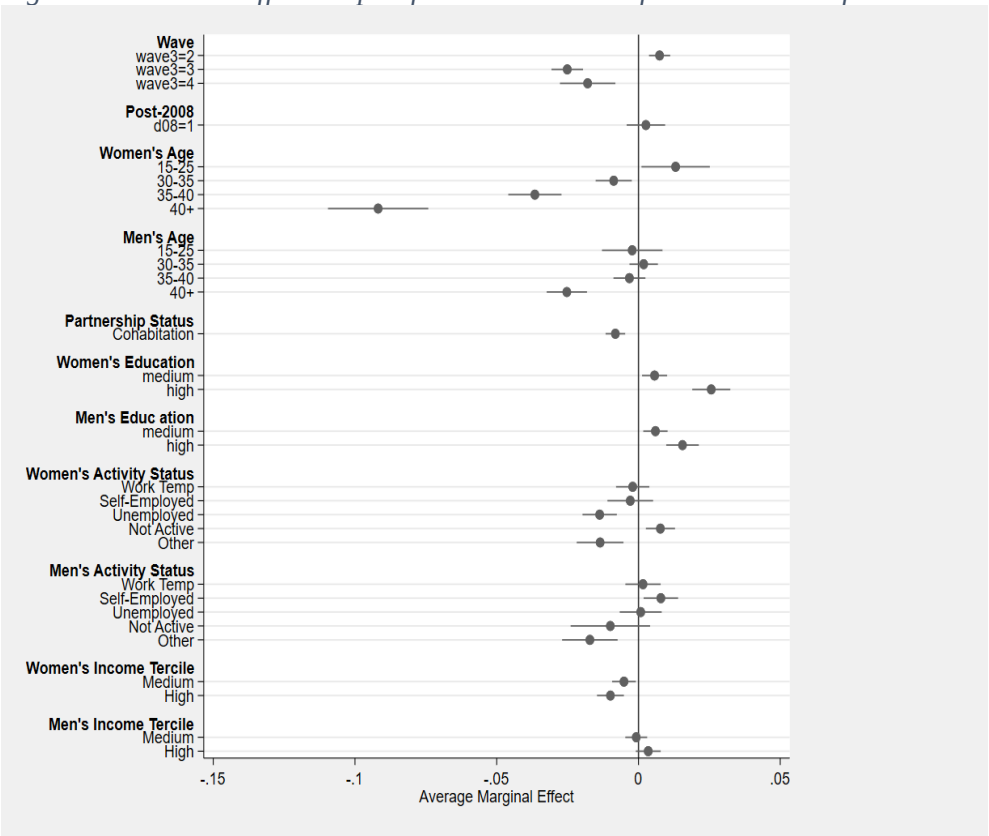
Source: Authors' elaboration on EU-SILC data

Figure A8: AMEs coefficients plot for the covariates of the second model for the conception of the second child



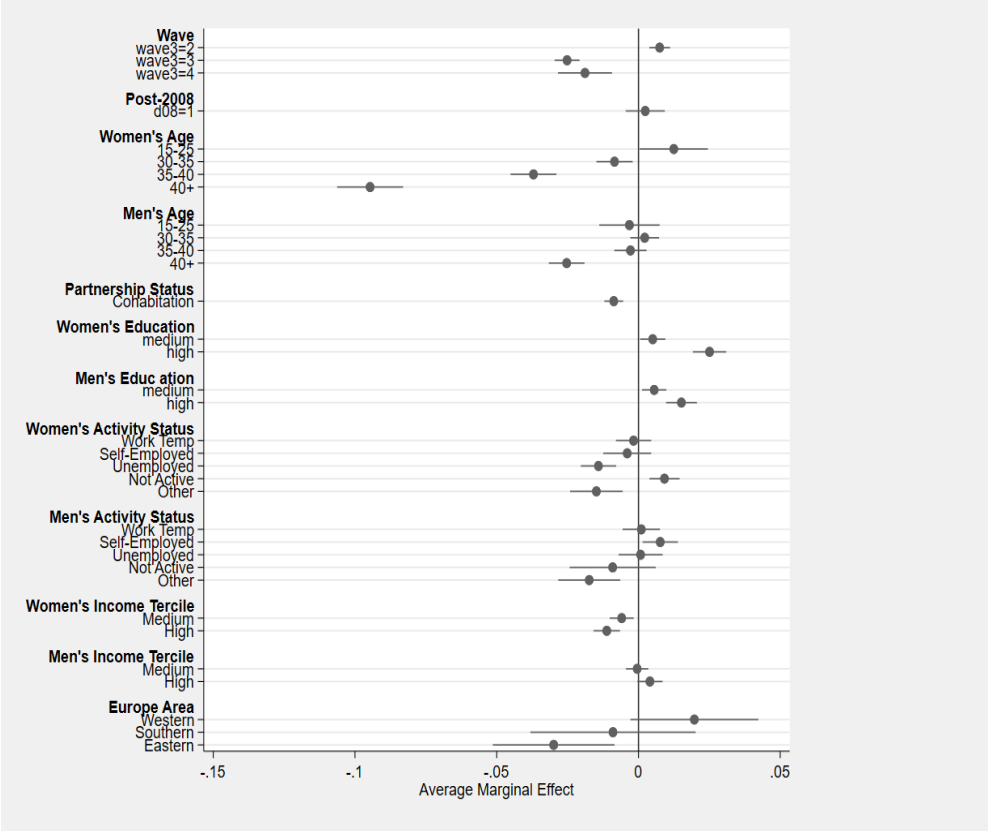
Source: Authors' elaboration on EU-SILC data

Figure A9: AMEs coefficients plot for the covariates of the third model for the conception of the second child



Source: Authors' elaboration on EU-SILC data

Figure A10: AMEs coefficients plot for the covariates of the fourth model for the conception of the second child



Source: Authors' elaboration on EU-SILC data

Figure A11: Predicted hazard to having the second child in the next year for the baseline couple, 2004-2015

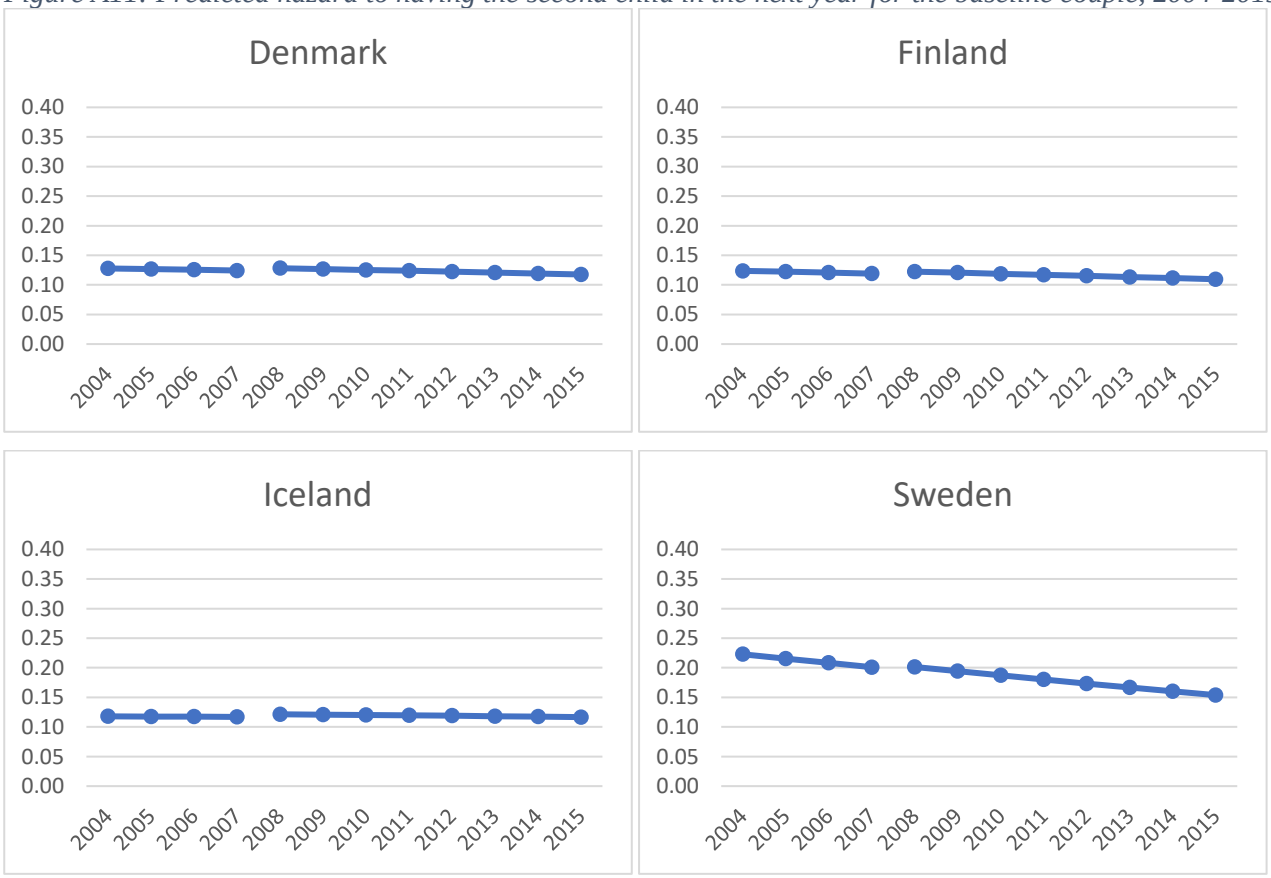
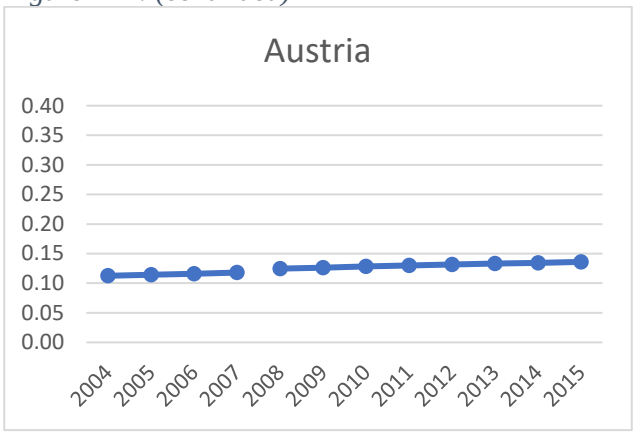
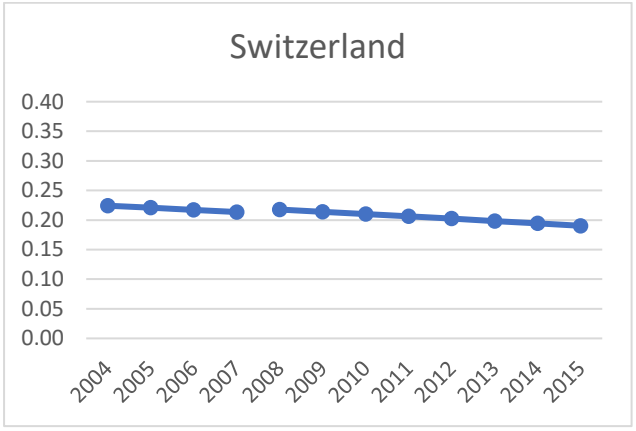
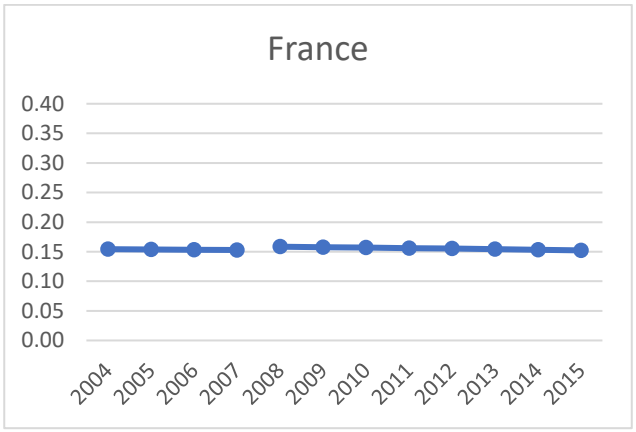
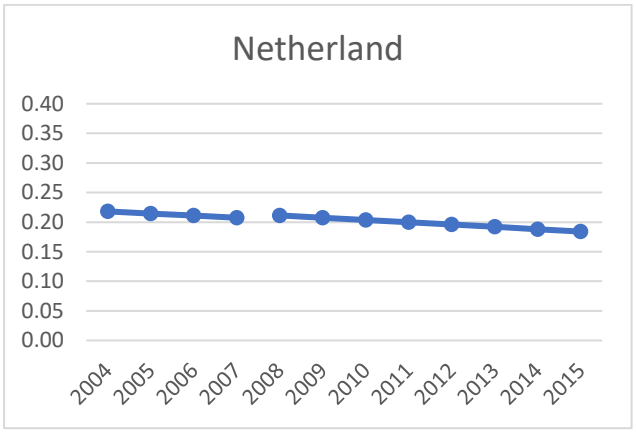


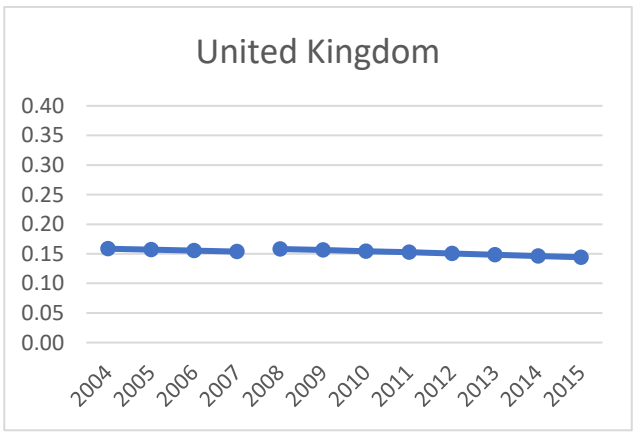
Figure A11: (continued)

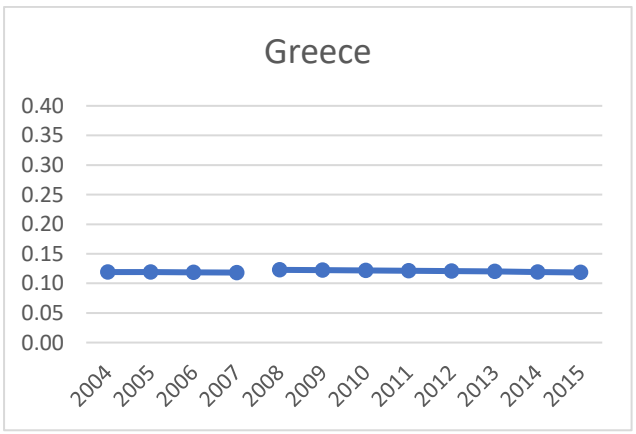


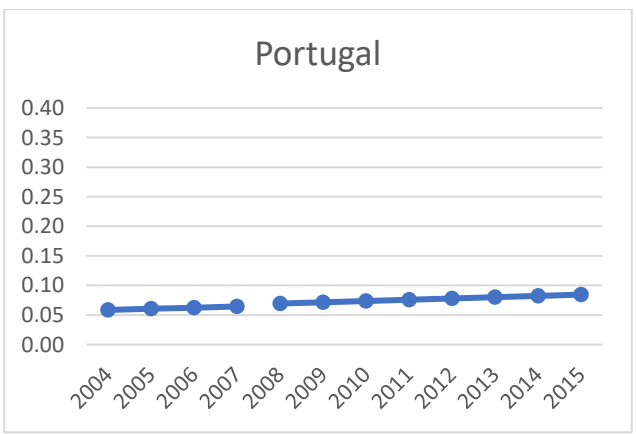


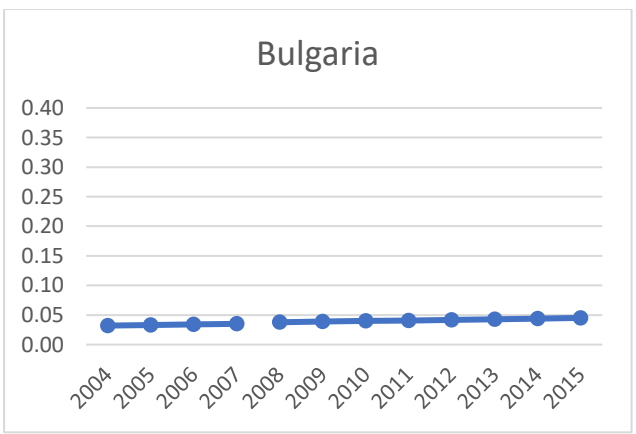












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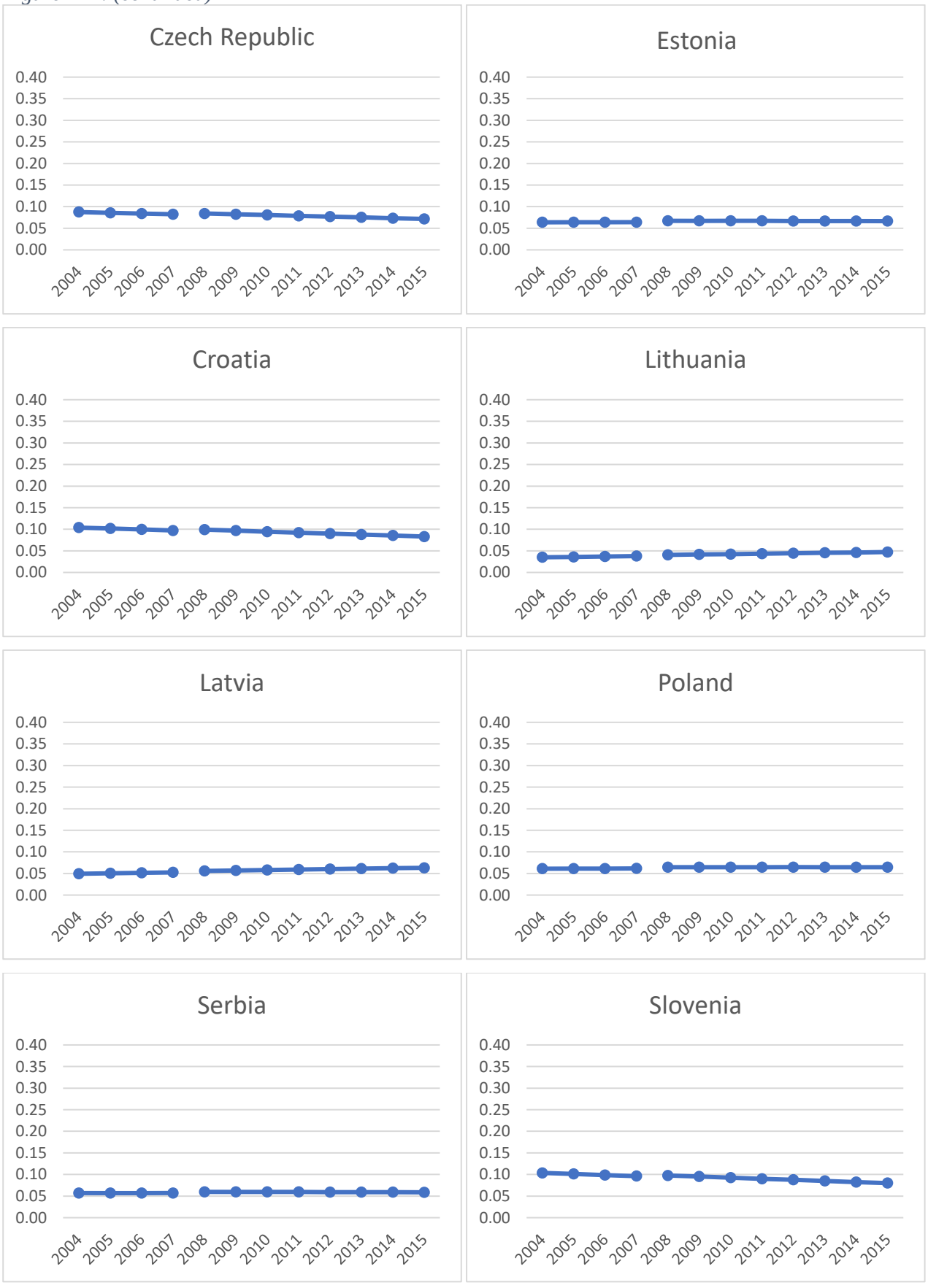

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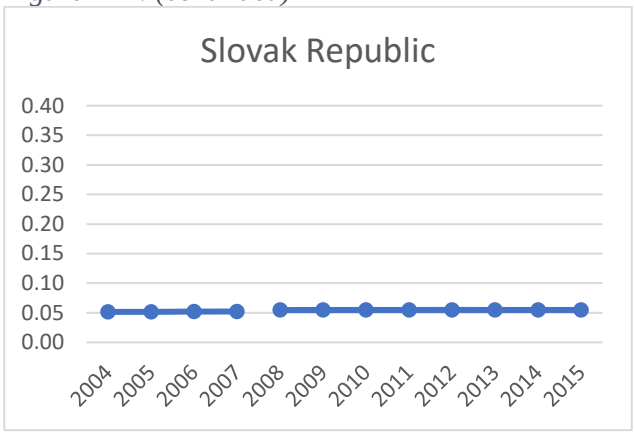
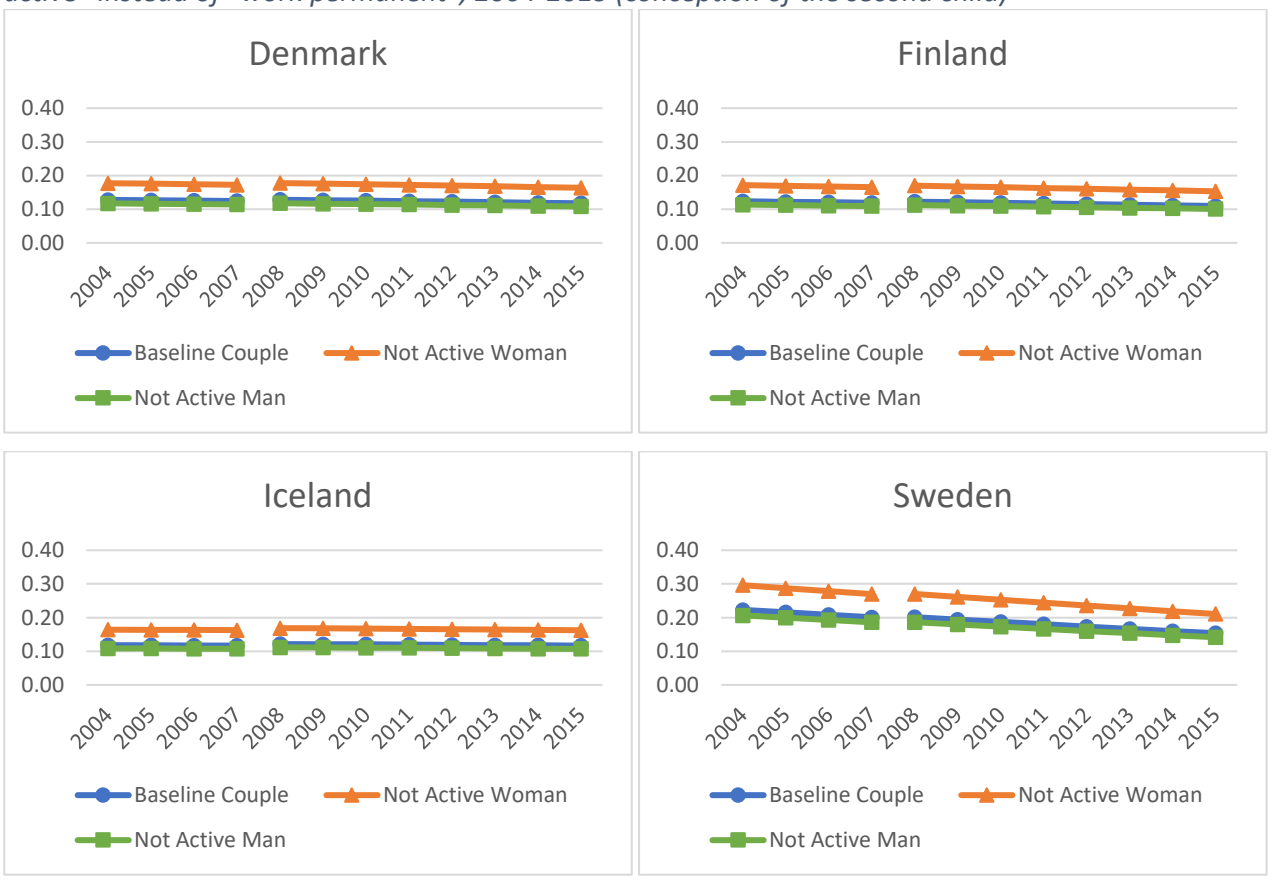


Source: Authors' elaboration on EU-SILC data

Figure A12: Levels of predicted hazard when the activity status of one of the partners in couple is "not active" instead of "work permanent", 2004-2015 (conception of the second child)



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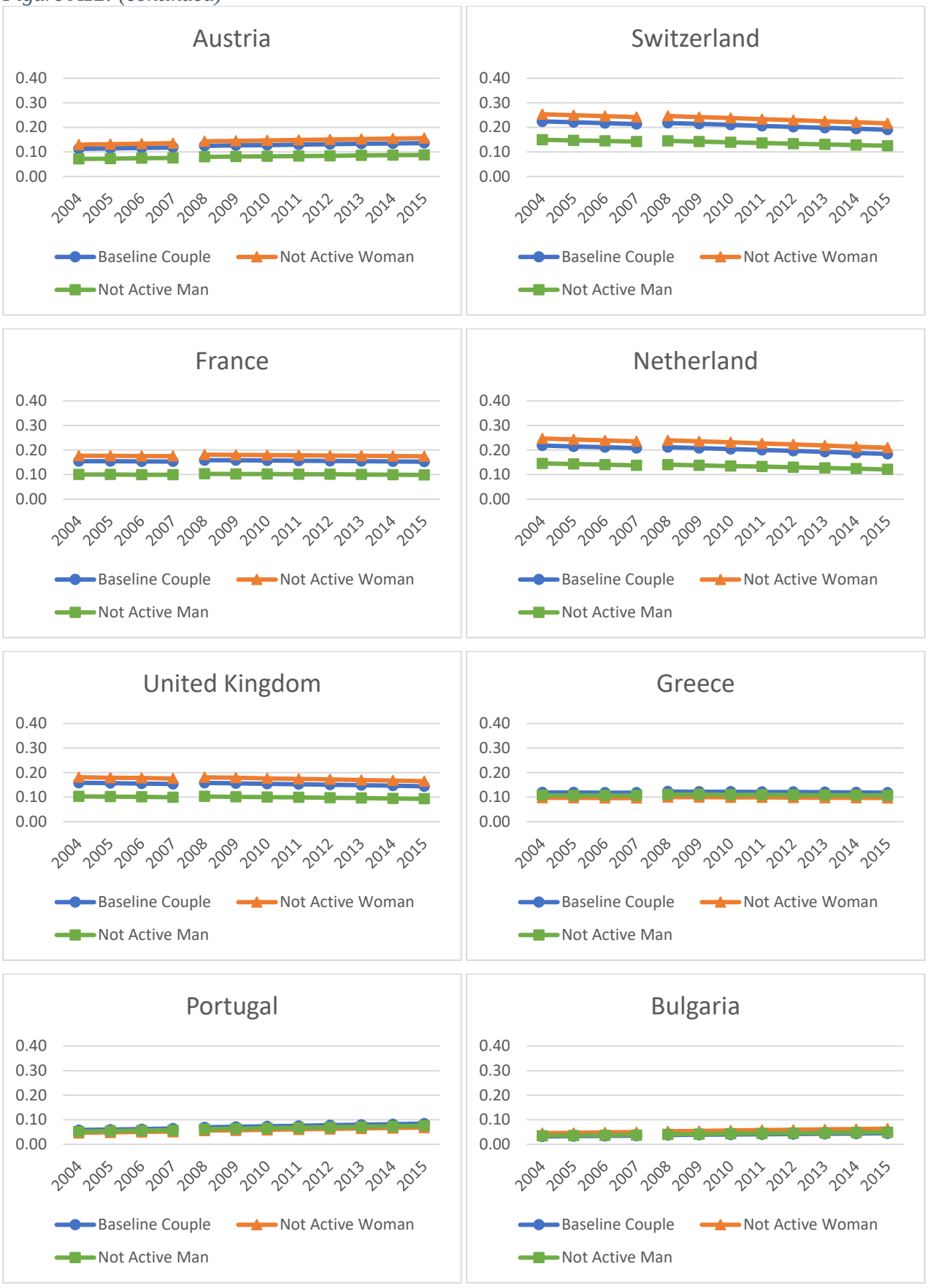

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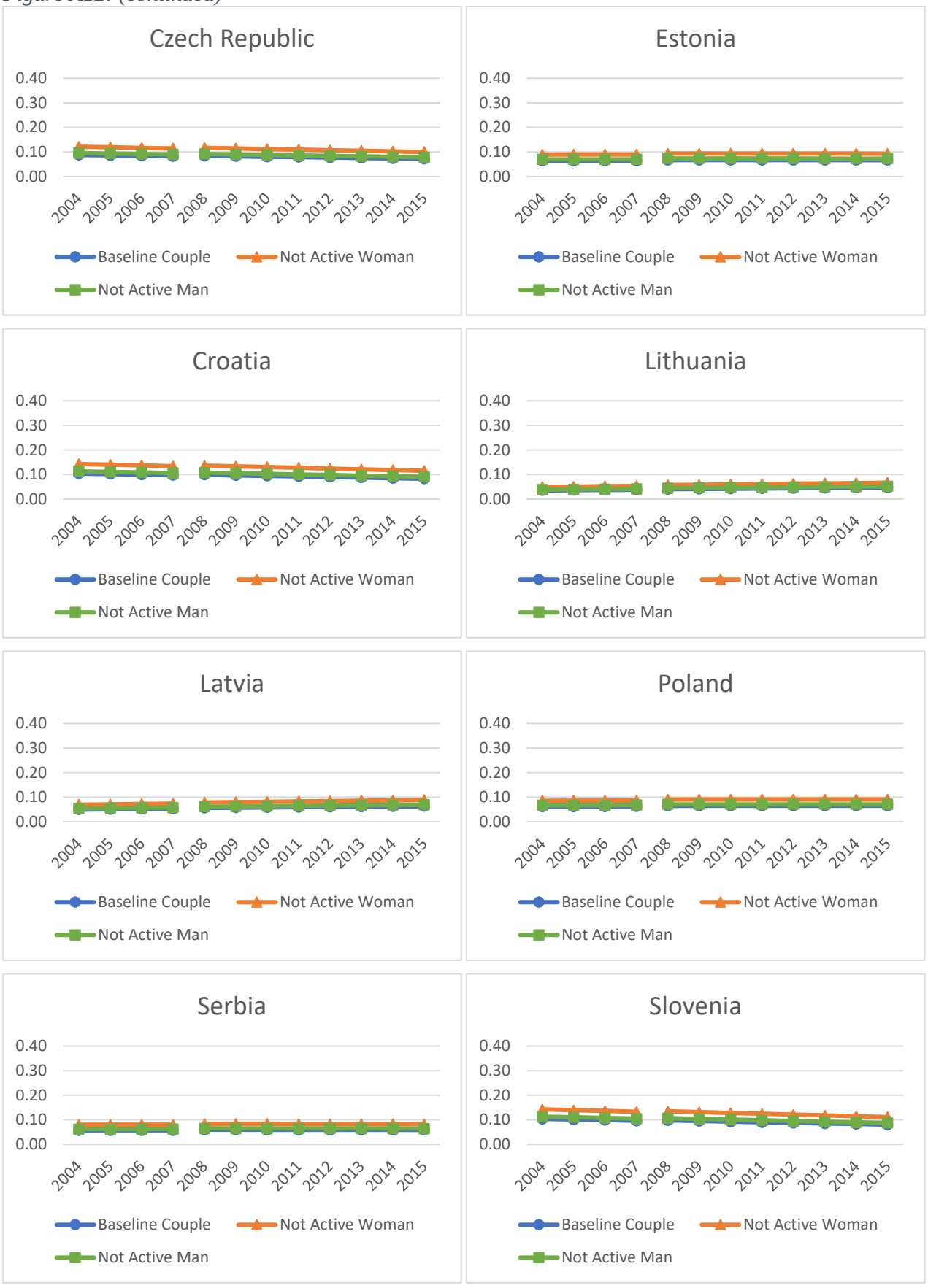
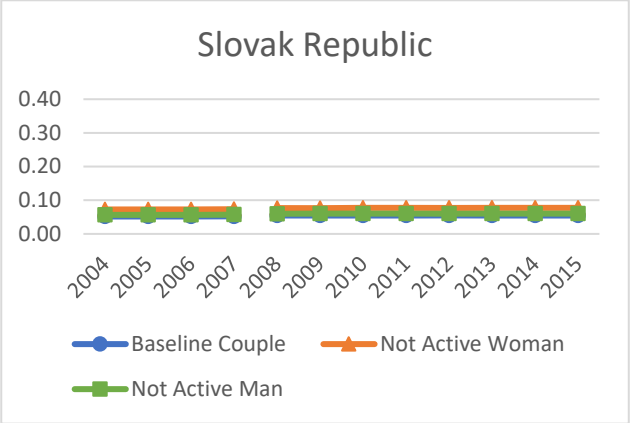


Figure A12: (continued)



Source: Authors' elaboration on EU-SILC data

Figure A13: Levels of predicted hazard when the activity status of one of the partners in couple is "unemployed" instead of "work permanent", 2004-2015 (conception of the second child)

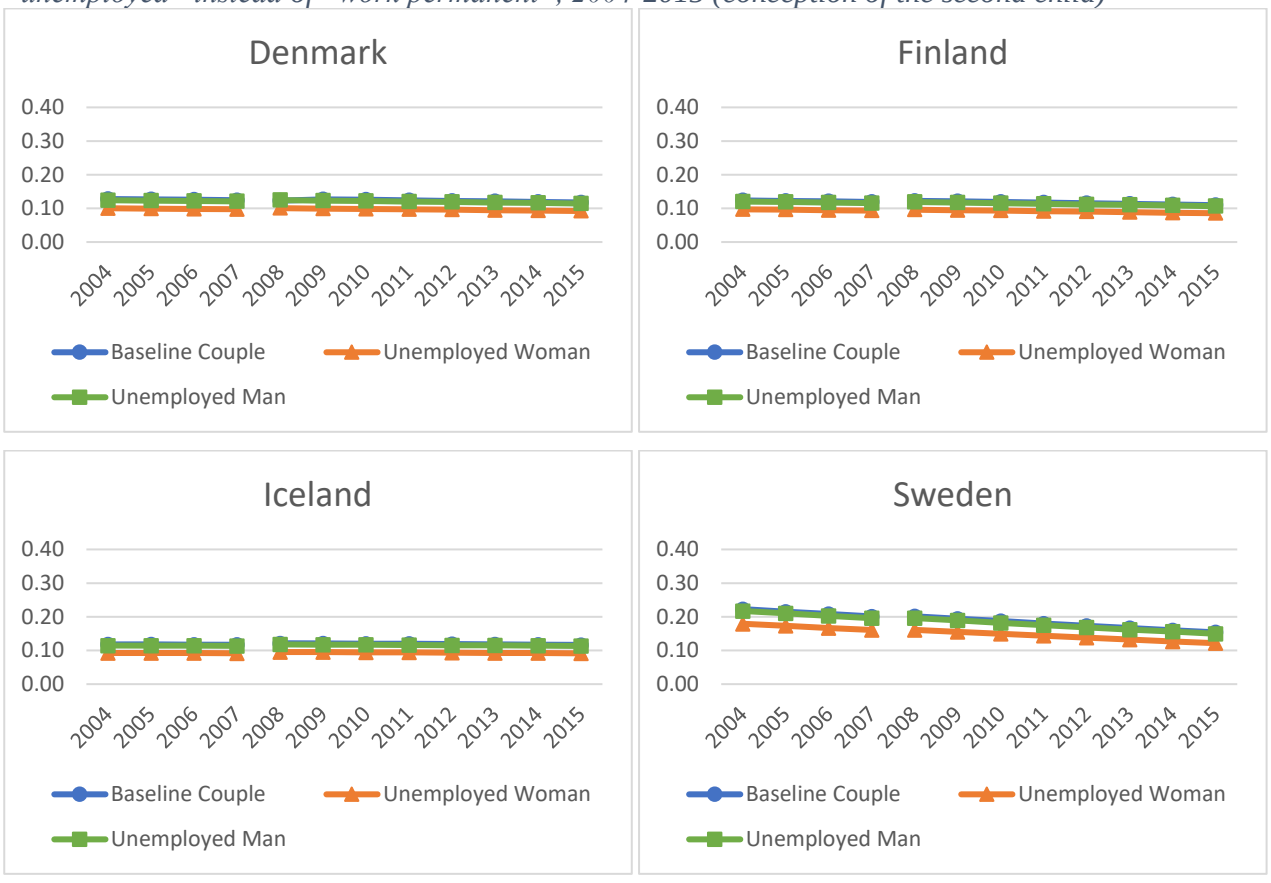


Figure A13: (continued)

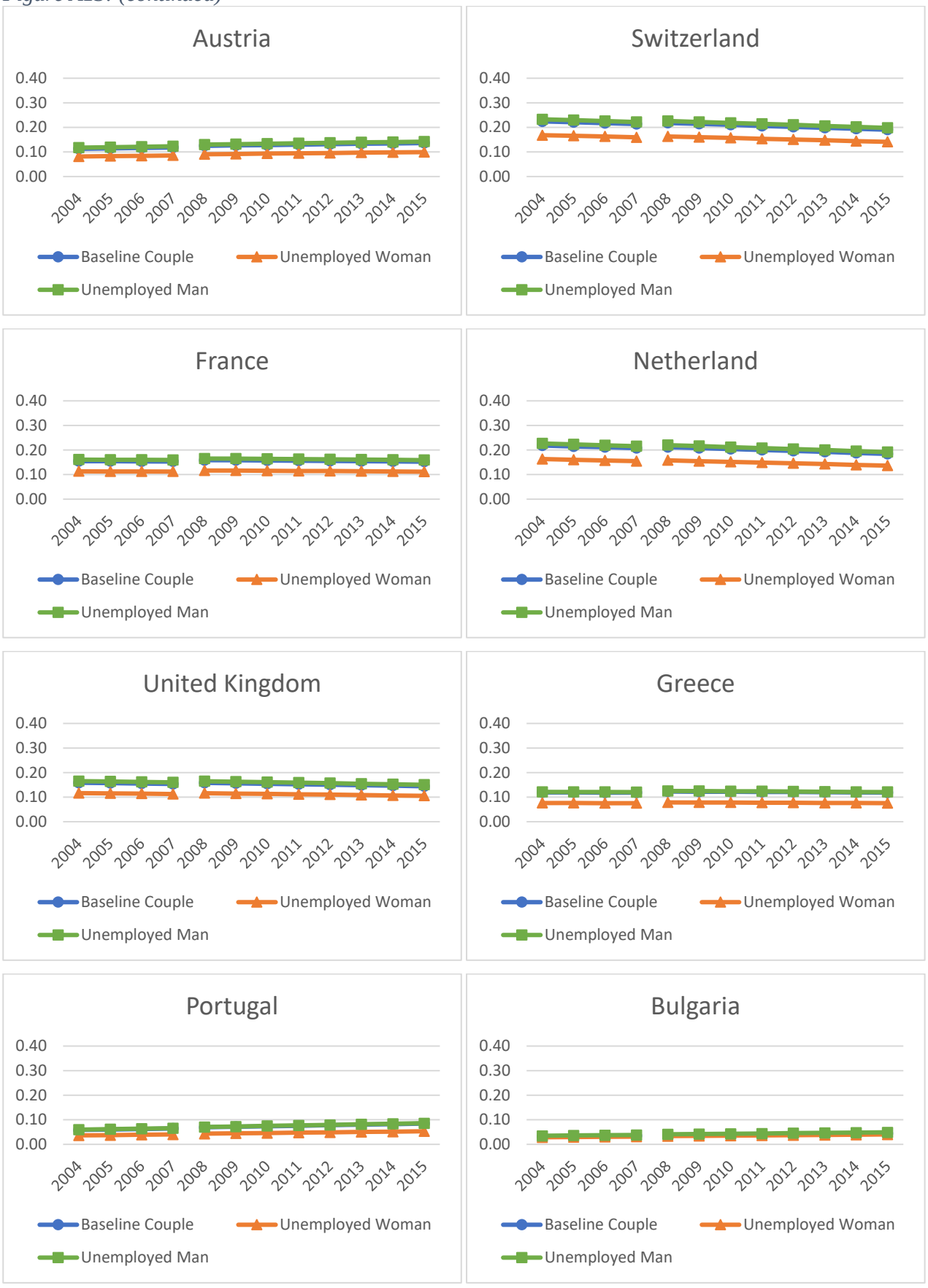


Figure A13: (continued)

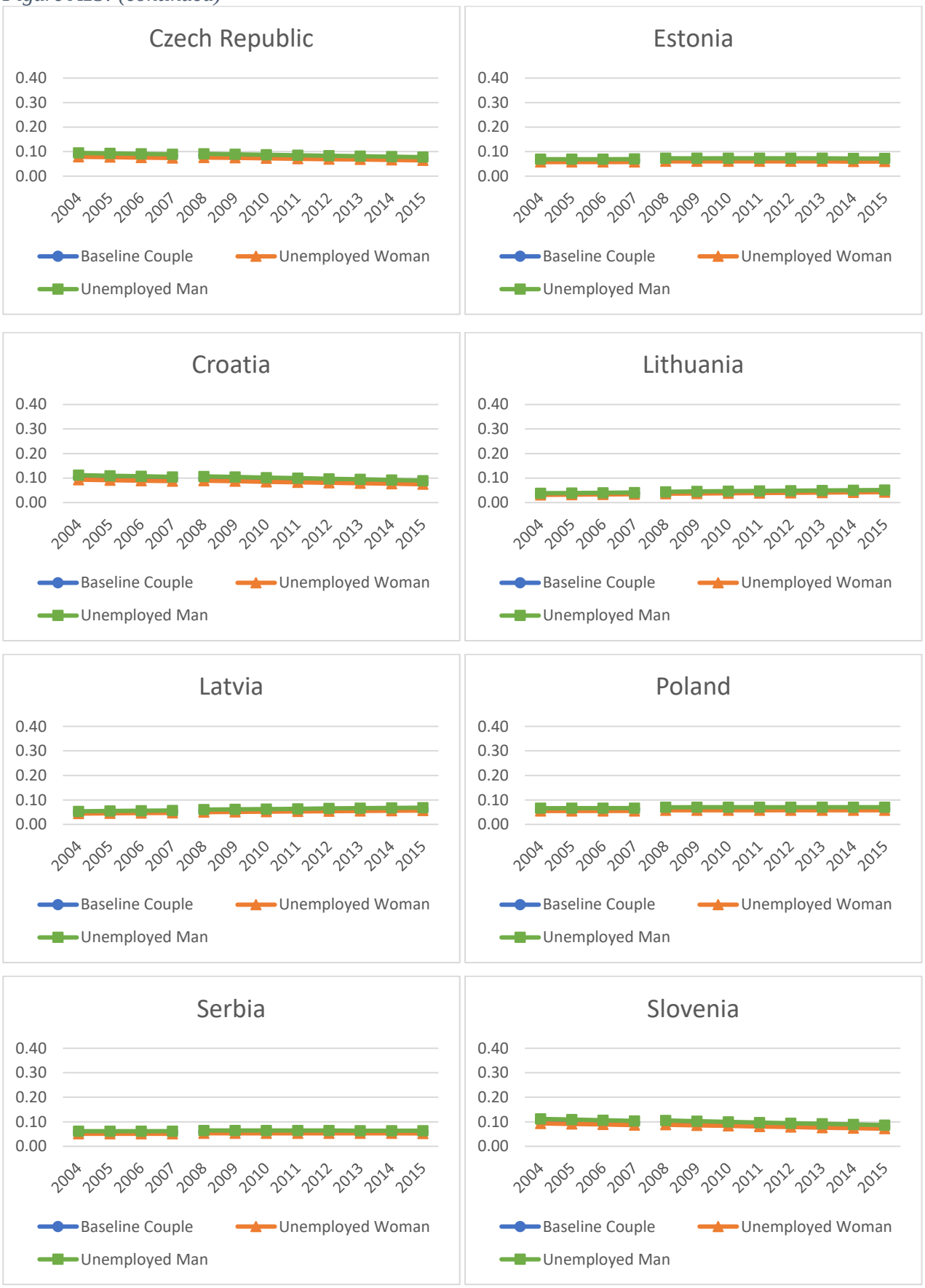
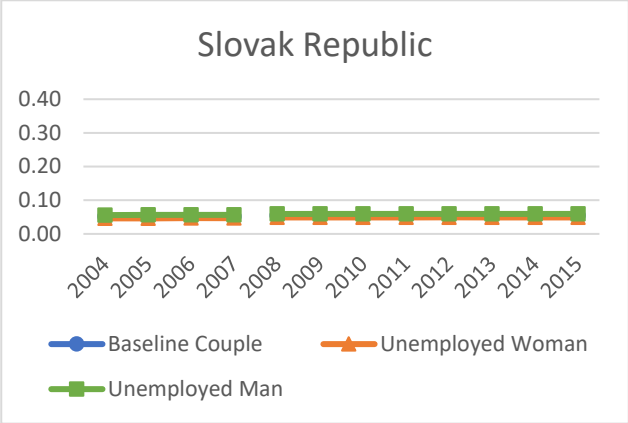


Figure A13: (continued)



Source: Authors' elaboration on EU-SILC data

Table A1: STATA code used for data preparation and analysis

```
/*(H)- We import the H dataset (families, detailed information) for all the years available by standardizing the name of the variables: interview year and family id. */
//2005
import delimited D:\...\Long\IT\UDB_lIT05H.csv
rename hb030 db030 //family id
rename hb010 db010 //year of interview
save D:\...\Long\IT\UDB_lIT05H.dta
clear
//2006
import delimited D:\...\Long\IT\UDB_lIT06H.csv
rename hb030 db030 // family id
rename hb010 db010 // year of interview
save D:\...\Long\IT\UDB_lIT06H.dta
clear
//2007
import delimited D:\...\Long\IT\UDB_lIT07H.csv
rename hb030 db030 // family id
rename hb010 db010 // year of interview
save D:\...\Long\IT\UDB_lIT07H.dta
clear
//2008
import delimited D:\...\Long\IT\UDB_lIT08H.csv
rename hb030 db030 // family id
rename hb010 db010 // year of interview
save D:\...\Long\IT\UDB_lIT08H.dta
clear
//2009
import delimited D:\...\Long\IT\UDB_lIT09H.csv
rename hb030 db030 // family id
rename hb010 db010 //year of interview
save D:\...\Long\IT\UDB_lIT09H.dta
clear
```

```
//2010
import delimited D:\...\Long\IT\UDB_lIT10H.csv
rename hb030 db030 // family id
rename hb010 db010 //year of interview
save D:\...\Long\IT\UDB_lIT10H.dta
clear
//2011
import delimited D:\...\Long\IT\UDB_lIT11H.csv
rename hb030 db030 // family id
rename hb010 db010 //year of interview
save D:\...\Long\IT\UDB_lIT11H.dta
clear
//2012
import delimited D:\...\Long\IT\UDB_lIT12H.csv
rename hb030 db030 // family id
rename hb010 db010 //year of interview
save D:\...\Long\IT\UDB_lIT12H.dta
clear
//2013
import delimited D:\...\Long\IT\UDB_lIT13H.csv
rename hb030 db030 // family id
rename hb010 db010 //year of interview
save D:\...\Long\IT\UDB_lIT13H.dta
clear
//2014
import delimited D:\...\Long\IT\UDB_lIT14H.csv
rename hb030 db030 // family id
rename hb010 db010 //year of interview
save D:\...\Long\IT\UDB_lIT14H.dta
clear
//2015
import delimited D:\...\Long\IT\UDB_lIT15H.csv
rename hb030 db030 // family id
rename hb010 db010 //year of interview
save D:\...\Long\IT\UDB_lIT15H.dta
clear
//2016
import delimited D:\...\Long\IT\UDB_lIT16H.csv
rename hb030 db030 // family id
rename hb010 db010 //year of interview
save D:\...\Long\IT\UDB_lIT16H.dta
clear
/*(D/H) - We combine dataset D (families, general information) with dataset H (families, detailed
information) for all the years available. */
//2005
import delimited D:\...\Long\IT\UDB_lIT05D.csv
merge 1:1 db030 db010 using D:\...\Long\IT\UDB_lIT05H
drop _merge
gen UDB=2005
save D:\...\Long\IT\UDB_lIT05DH.dta
```

```
clear
//2006
import delimited D:\...\Long\IT\UDB_lIT06D.csv
merge 1:1 db030 db010 using D:\...\Long\IT\UDB_lIT06H
drop _merge
gen UDB=2006
save D:\...\Long\IT\UDB_lIT06DH.dta
clear
//2007
import delimited D:\...\Long\IT\UDB_lIT07D.csv
merge 1:1 db030 db010 using D:\...\Long\IT\UDB_lIT07H
drop _merge
gen UDB=2007
save D:\...\Long\IT\UDB_lIT07DH.dta
clear
//2008
import delimited D:\...\Long\IT\UDB_lIT08D.csv
merge 1:1 db030 db010 using D:\...\Long\IT\UDB_lIT08H
drop _merge
gen UDB=2008
save D:\...\Long\IT\UDB_lIT08DH.dta
clear
//2009
import delimited D:\...\Long\IT\UDB_lIT09D.csv
merge 1:1 db030 db010 using D:\...\Long\IT\UDB_lIT09H
drop _merge
gen UDB=2009
save D:\...\IT\UDB_lIT09DH.dta
clear
 //2010
import delimited D:\...\Long\IT\UDB_lIT10D.csv
merge 1:1 db030 db010 using D:\...\Long\IT\UDB_lIT10H
drop _merge
gen UDB=2010
save D:\...\Long\IT\UDB_lIT10DH.dta
clear
//2011
import delimited D:\...\Long\IT\UDB_lIT11D.csv
merge 1:1 db030 db010 using D:\Giulia\Dottorato\Progetto\Dati\Long\IT\UDB_lIT11H
drop _merge
gen UDB=2011
save D:\...\Long\IT\UDB_lIT11DH.dta
clear
//2012
import delimited D:\...\Long\IT\UDB_lIT12D.csv
merge 1:1 db030 db010 using D:\...\Long\IT\UDB_lIT12H
drop _merge
gen UDB=2012
save D:\...\Long\IT\UDB_lIT12DH.dta
clear
```

```
//2013
import delimited D:\...\Long\IT\UDB_lIT13D.csv
merge 1:1 db030 db010 using D:\...\Long\IT\UDB_lIT13H
drop _merge
gen UDB=2013
save D:\...\Long\IT\UDB_lIT13DH.dta
clear
//2014
import delimited D:\...\Long\IT\UDB_lIT14D.csv
merge 1:1 db030 db010 using D:\...\Long\IT\UDB_lIT14H
drop _merge
gen UDB=2014
save D:\...\Long\IT\UDB_lIT14DH.dta
clear
//2015
import delimited D:\...\Long\IT\UDB_lIT15D.csv
merge 1:1 db030 db010 using D:\...\Long\IT\UDB_lIT15H
drop _merge
gen UDB=2015
save D:\...\Long\IT\UDB_lIT15DH.dta
clear
//2016
import delimited D:\...\Long\IT\UDB_lIT16D.csv
merge 1:1 db030 db010 using D:\...\Long\IT\UDB_lIT16H
drop _merge
gen UDB=2016
save D:\...\Long\IT\UDB_lIT16DH.dta
clear
/*(P) - We import the dataset P (individuals, detailed information) for all the years available and
uniform the variables: interview year, individual id and family id. */
//2005
import delimited D:\...\Long\IT\UDB_lIT05P.csv
rename pb030 rb030 //individual id
rename pb010 rb010 //year of interview
rename px030 rb040 // family id
save D:\...\Long\IT\UDB_lIT05P.dta
clear
//2006
import delimited D:\...\Long\IT\UDB_lIT06P.csv
rename pb030 rb030 // individual id
rename pb010 rb010 //year of interview
rename px030 rb040 // family id
save D:\...\Long\IT\UDB_lIT06P.dta
clear
//2007
import delimited D:\...\Long\IT\UDB_lIT07P.csv
rename pb030 rb030 // individual id
rename pb010 rb010 //year of interview
rename px030 rb040 // family id
save D:\...\Long\IT\UDB_lIT07P.dta
```

```
clear
//2008
import delimited D:\...\Long\IT\UDB_lIT08P.csv
rename pb030 rb030 // individual id
rename pb010 rb010 //year of interview
rename px030 rb040 // family id
save D:\...\Long\IT\UDB_lIT08P.dta
clear
//2009
import delimited D:\...\IT\UDB_lIT09P.csv
rename pb030 rb030 // individual id
rename pb010 rb010 //year of interview
rename px030 rb040 // family id
save D:\...\IT\UDB_lIT09P.dta
clear
//2010
import delimited D:\...\Long\IT\UDB_lIT10P.csv
rename pb030 rb030 // individual id
rename pb010 rb010 //year of interview
rename px030 rb040 // family id
save D:\...\IT\UDB_lIT10P.dta
clear
//2011
import delimited D:\...\Long\IT\UDB_lIT11P.csv
rename pb030 rb030 // individual id
rename pb010 rb010 //year of interview
rename px030 rb040 // family id
save D:\...\Long\IT\UDB_lIT11P.dta
clear
//2012
import delimited D:\...\Long\IT\UDB_lIT12P.csv
rename pb030 rb030 // individual id
rename pb010 rb010 //year of interview
rename px030 rb040 // family id
save D:\...\Long\IT\UDB_lIT12P.dta
clear
//2013
import delimited D:\...\Long\IT\UDB_lIT13P.csv
rename pb030 rb030 // individual id
rename pb010 rb010 //year of interview
rename px030 rb040 // family id
save D:\...\Long\IT\UDB_lIT13P.dta
clear
//2014
import delimited D:\...\Long\IT\UDB_lIT14P.csv
rename pb030 rb030 // individual id
rename pb010 rb010 //year of interview
rename px030 rb040 // family id
save D:\...\Long\IT\UDB_lIT14P.dta
clear
```

```
//2015
import delimited D:\...\Long\IT\UDB_lIT15P.csv
rename pb030 rb030 // individual id
rename pb010 rb010 //year of interview
rename px030 rb040 // family id
save D:\...\Long\IT\UDB_lIT15P.dta
clear
//2016
import delimited D:\...\Long\IT\UDB_lIT16P.csv
rename pb030 rb030 // individual id
rename pb010 rb010 //year of interview
rename px030 rb040 //family id
save D:\...\Long\IT\UDB_lIT16P.dta
clear
/*(R/P) - We combine the R dataset (individuals, general information) with the P dataset
(individuals, detailed information) for all available years. */
//2005
import delimited D:\...\Long\IT\UDB_lIT05R.csv
merge 1:1 rb030 rb010 rb040 using D:\G...\Long\IT\UDB_lIT05P
drop _merge
save D:\...\Long\IT\UDB_lIT05RP.dta
clear
//2006
import delimited D:\...\Long\IT\UDB_lIT06R.csv
merge 1:1 rb030 rb010 rb040 using D:\...\Long\IT\UDB_lIT06P
drop _merge
save D:\...\Long\IT\UDB_lIT06RP.dta
clear
//2007
import delimited D:\...\Long\IT\UDB_lIT07R.csv
merge 1:1 rb030 rb010 rb040 using D:\...\Long\IT\UDB_lIT07P
drop _merge
save D:\...\Long\IT\UDB_lIT07RP.dta
clear
//2008
import delimited D:\...\Long\IT\UDB_lIT08R.csv
merge 1:1 rb030 rb010 rb040 using D:\...\Long\IT\UDB_lIT08P
drop _merge
save D:\...\Long\IT\UDB_lIT08RP.dta
clear
//2009
import delimited D:\...\Long\IT\UDB_lIT09R.csv
merge 1:1 rb030 rb010 rb040 using D:\...\Long\IT\UDB_lIT09P
drop _merge
save D:\...\Long\IT\UDB_lIT09RP.dta
clear
//2010
import delimited D:\...\Long\IT\UDB_lIT10R.csv
merge 1:1 rb030 rb010 rb040 using D:\...\Long\IT\UDB_lIT10P
drop _merge
```

```
save D:\...\Long\IT\UDB_lIT10RP.dta
clear
//2011
import delimited D:\...\Long\IT\UDB_lIT11R.csv
merge 1:1 rb030 rb010 rb040 using D:\...\Long\IT\UDB_lIT11P
drop _merge
save D:\...\Long\IT\UDB_lIT11RP.dta
clear
//2012
import delimited D:\...\Long\IT\UDB_lIT12R.csv
merge 1:1 rb030 rb010 rb040 using D:\...\Long\IT\UDB_lIT12P
drop _merge
save D:\...\Long\IT\UDB_lIT12RP.dta
clear
//2013
import delimited D:\...\Long\IT\UDB_lIT13R.csv
merge 1:1 rb030 rb010 rb040 using D:\...\Long\IT\UDB_lIT13P
drop _merge
save D:\...\Long\IT\UDB_lIT13RP.dta
clear
//2014
import delimited D:\...\Long\IT\UDB_lIT14R.csv
merge 1:1 rb030 rb010 rb040 using D:\...\Long\IT\UDB_lIT14P
drop _merge
save D:\...Long\IT\UDB_lIT14RP.dta
clear
//2015
import delimited D:\...\Long\IT\UDB_lIT15R.csv
merge 1:1 rb030 rb010 rb040 using D:\...\Long\IT\UDB_lIT15P
drop _merge
save D:\...\Long\IT\UDB_lIT15RP.dta
clear
//2016
import delimited D:\...\Long\IT\UDB_lIT16R.csv
merge 1:1 rb030 rb010 rb040 using D:\...\Long\IT\UDB_lIT16P
drop _merge
save D:\...\Long\IT\UDB_lIT16RP.dta
clear
/*We combine the dataset of individuals with that of families (m: 1), for all the years available.
Uniform variables: family id and interview year. I use the merge command according to the
variables: family id and interview year. */
//2005
use "D:\...\Long\IT\UDB_lIT05RP.dta", clear
rename rb040 db030 //family id
rename rb010 db010 //year of interview
merge m:1 db030 db010 using D:\...\Long\IT\UDB_lIT05DH.dta
drop _merge
save D:\...\Long\IT\UDB_lIT05m1.dta
clear
//2006
```

```
use "D:\...\Long\IT\UDB_lIT06RP.dta", clear
rename rb040 db030 // family id
rename rb010 db010 //year of interview
merge m:1 db030 db010 using D:\...\Long\IT\UDB_lIT06DH.dta
drop _merge
save D:\...\Long\IT\UDB_lIT06m1.dta
clear
//2007
use "D:\...\Long\IT\UDB_lIT07RP.dta", clear
rename rb040 db030 // family id
rename rb010 db010 //year of interview
merge m:1 db030 db010 using D:\...\Long\IT\UDB_lIT07DH.dta
drop _merge
save D:\...\Long\IT\UDB_lIT07m1.dta
clear
//2008
use "D:\...\Long\IT\UDB_lIT08RP.dta", clear
rename rb040 db030 // family id
rename rb010 db010 //year of interview
merge m:1 db030 db010 using D:\...\Long\IT\UDB_lIT08DH.dta
drop _merge
save D:\...\Long\IT\UDB_lIT08m1.dta
clear
//2009
use "D:\...\Long\IT\UDB_lIT09RP.dta", clear
rename rb040 db030 // family id
rename rb010 db010 //year of interview
merge m:1 db030 db010 using D:\...\Long\IT\UDB_lIT09DH.dta
drop _merge
save D:\...\Long\IT\UDB_lIT09m1.dta
clear
//2010
use "D:\...\Long\IT\UDB_lIT10RP.dta", clear
rename rb040 db030 // family id
rename rb010 db010 //year of interview
merge m:1 db030 db010 using D:\...\Long\IT\UDB_lIT10DH.dta
drop _merge
save D:\...\Long\IT\UDB_lIT10m1.dta
clear
//2011
use "D:\...\Long\IT\UDB_lIT11RP.dta", clear
rename rb040 db030 // family id
rename rb010 db010 //year of interview
merge m:1 db030 db010 using D:\...\Long\IT\UDB_lIT11DH.dta
drop _merge
save D:\...\Long\IT\UDB_lIT11m1.dta
clear
//2012
use "D:\...\Long\IT\UDB_lIT12RP.dta", clear
rename rb040 db030 // family id
```

```
rename rb010 db010 //year of interview
merge m:1 db030 db010 using D:\...\Long\IT\UDB_lIT12DH.dta
drop _merge
save D:\...\Long\IT\UDB_lIT12m1.dta
clear
//2013
use "D:\...\Long\IT\UDB_lIT13RP.dta", clear
rename rb040 db030 // family id
rename rb010 db010 //year of interview
merge m:1 db030 db010 using D:\...\Long\IT\UDB_lIT13DH.dta
drop _merge
save D:\...\Long\IT\UDB_lIT13m1.dta
clear
//2014
use "D:\...\Long\IT\UDB_lIT14RP.dta", clear
rename rb040 db030 // family id
rename rb010 db010 //year of interview
merge m:1 db030 db010 using D:\...\Long\IT\UDB_lIT14DH.dta
drop _merge
save D:\...\Long\IT\UDB_lIT14m1.dta
clear
//2015
use "D:\...\Long\IT\UDB_lIT15RP.dta", clear
rename rb040 db030 // family id
rename rb010 db010 //year of interview
merge m:1 db030 db010 using D:\...\Long\IT\UDB_lIT15DH.dta
drop _merge
save D:\...\Long\IT\UDB_lIT15m1.dta
clear
//2016
use "D:\...\Long\IT\UDB_lIT16RP.dta", clear
rename rb040 db030 // family id
rename rb010 db010 //year of interview
merge m:1 db030 db010 using D:\...\Long\IT\UDB_lIT16DH.dta
drop _merge
save D:\...\Long\IT\UDB_lIT16m1.dta
clear
/*We combine the complete datasets (information for individuals and families) for all available
years. */
use "D:\...\Long\IT\UDB_lIT05m1.dta", clear
append using D:\...\Long\IT\UDB_lIT06m1.dta
append using D:\...\Long\IT\UDB_lIT07m1.dta
append using D:\...\Long\IT\UDB_lIT08m1.dta
append using D:\...\Long\IT\UDB_lIT09m1.dta
append using D:\...\Long\IT\UDB_lIT10m1.dta
append using D:\...\Long\IT\UDB_lIT11m1.dta
append using D:\...\Long\IT\UDB_lIT12m1.dta
append using D:\...\Long\IT\UDB_lIT13m1.dta
append using D:\...\Long\IT\UDB_lIT14m1.dta
append using D:\...\Long\IT\UDB_lIT15m1.dta
```

```
append using D:\...\Long\IT\UDB_lIT16m1.dta
drop if rb030==. // we drop families without individuals
/* We drop duplicate individuals by checking for: interview year, individual id and family id. */
duplicates drop db010 rb030 db030, force
/* We sort the dataset according to individual id, interview year and family id. */
sort rb030 db010 db030
/*We check that there are no duplicate years following family splits. When a family split occurs
the last number of the family id is 1 and not 0. */
gen split_fam=mod(db030,10)
gen id_fam=db030
replace id_fam=db030-1 if split_fam==1
drop if split_fam[_n]==0 & rb030[_n]==rb030[_n+1] & db010[_n]==db010[_n+1] &
split_fam[_n+1]==1
/*We recover, where possible, the years of birth and eliminate individuals who do not have the
information regarding the year of birth. */
replace rb080=rb080[_n-1] if rb030[_n]==rb030[_n-1] & rb080[_n]==.
replace rb080=rb080[_n+1] if rb030[_n]==rb030[_n+1] & rb080[_n]==.
drop if rb080==.
/*We generate age variable*/
gen eta=db010-rb080
/*We drop women who are over 50 */
drop if rb090==2 & eta>=50
/*We check that there are no individuals who have the same id but a different year of birth. If
there are individuals who have the same id but different year of birth, I sign one with cont = 1 and
the other with cont2 = 1. */
gen cont=1 if rb030[_n]==rb030[_n+1] & rb080[_n]!=rb080[_n+1] & ///
db010[_n]!=db010[_n+1]-1
forvalues i=1(1)9{
replace cont=1 if rb030[_n]==rb030[_n+1] & cont[_n+1]==1 & db010[_n]<db010[_n+1]
}
gen cont2=1 if rb030[_n]==rb030[_n-1] & rb080[_n]!=rb080[_n-1] & ///
db010[_n]!=db010[_n-1]+1
forvalues i=1(1)9{
replace cont2=1 if rb030[_n]==rb030[_n-1] & cont2[_n-1]==1 & db010[_n]>db010[_n-1]
}
/*We generate a variable that counts the years in which each of the two individuals (with the
same id) has been under observation so as to keep the individual that has been observed for more
years (if the number of years is the same we keep the first individual). */
by rb030: egen ind1=count(cont)
by rb030: egen ind2=count(cont2)
drop if cont==1 & ind<=ind2 & ind!=0 & ind2!=0
drop if cont2==1 & ind2<ind & ind2!=0 & ind!=0
drop cont cont2 ind ind2
save D:\...\Long\IT\UDB_lITpul.dta, replace
clear
//*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/
/*We generate a dataset in which there are only those individuals for whom we have the
information on the mother id available. */
use "D:\...\Long\IT\UDB_lITpul.dta", clear
drop if rb230==. //we drop who has no mother id
```

```
gen long idmam=rb230 //we make a copy of mother id variable
keep db010 db030 rb030 rb090 rb070 rb080 rb220 rb230 rb240 rx010 idmam
//we put a _fm (children / mothers) for all the variables to distinguish them later
foreach var of varlist *{
rename `var' `var'_fm
}
save "D:\...\Long\IT\FigliM.dta", replace
clear
//*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/
/* We generate a dataset in which there are only those individuals for whom we have information
on the father id. */
use "D:\...\Long\IT\UDB_lITpul.dta", clear
drop if rb220==. // we drop who has no father id
gen long idbab=rb220 // we make a copy of father's id variable
keep db010 db030 rb030 rb090 rb070 rb080 rb220 rb230 rb240 rx010 idbab
//we put a _fb (children / fathers) for all the variables to distinguish them later
foreach var of varlist *{
rename `var' `var'_fb
}
save "D:\...\Long\IT\FigliB.dta", replace
clear
//*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/
/*We generate a dataset in which we keep only the women who have the information on the
variable partner id. */
use "D:\...\Long\IT\UDB_lITpul.dta", clear
drop if rb090==1 //we drop men
//we put a _d (women) for all the variables to distinguish them later
foreach var of varlist *{
rename `var' `var'_d
}
save "D:\...\Long\IT\DonneP.dta", replace
clear
//*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/
/*We generate a dataset in which we keep only the men who have the information on the variable
partner id. */
use "D:\...\Long\IT\UDB_lITpul.dta", clear
drop if rb090==2 //we drop women
//we put a _u (men) for all the variables to distinguish them later
foreach var of varlist *{
rename `var' `var'_u
}
/*We make uniform the partner id variable so that we can merge with the women dataset. */
gen long idpart_u=rb240_u
rename rb240_u rb030_d
rename idpart_u rb240_u
label variable rb240_u "idpart_u"
save "D:\..\Long\IT\UominiP.dta", replace
clear
//*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/
```

```
/*We generate a dataset in which we put together men and women according to interview year,
family id and individual id. */
use "D:\...\Long\IT\DonneP.dta", clear
/*We make uniform the partner id variable so that we can merge with the men dataset. */
gen long idpart_d=rb240_d
rename rb240_d rb030_u
rename idpart_d rb240_d
label variable rb240_d "idpart_d"
rename db010_d db010_u //year of interview
rename db030_d db030_u //family id
merge 1:1 db010_u db030_u rb030_u rb030_d using D:\...\Long\IT\UominiP.dta
/*We drop women and men without partner. */
drop if _merge==1
drop if _merge==2
save "D:\...\Long\IT\Partner.dta", replace
clear
//*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/
/*We generate a dataset that associates each mother (in the couples' dataset) with her children
according to the variable mother id. */
use "D:\...\Long\IT\FigliM.dta", clear
/*We make uniform the variables for the next merge (m:1). */
rename rb230_fm rb030_d
rename idmam_fm rb230_fm
label variable rb230_fm "idmam_fm"
rename db010_fm db010_u
rename db030_fm db030_u
merge m:1 db010_u db030_u rb030_d using D:\...\Long\IT\Partner.dta
/*We drop children who have not been associated with any mother. */
drop if _merge==1
/*We rename the variable obtained after the merge in order to subsequently distinguish the
children associated with a single parent or both. */
rename _merge m_m_f
/*We sort the dataset so that the children are listed by date of birth. */
sort db030_u rb030_d rb080_d db010_u rb080_fm
/*We count the children per woman sorted by date of birth. */
by db030_u rb030_d rb080_d db010_u: gen sub=_n
/*We put all the children in the same row*/
reshape wide *_fm, i(db010_u db030_u rb030_d) j(sub)
save "D:\...\Long\IT\PartFM.dta", replace
clear
//*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/
/*We generate a dataset that associates to each father (in the couples' dataset) their children
according to the variable father id. */
use "D:\...\Long\IT\FigliB.dta", clear
/*We make uniform the variables for the next merge (m:1). */
rename rb220_fb rb030_u
rename idbab_fb rb220_fb
label variable rb220_fb "idbab_fb"
rename db010_fb db010_u
rename db030_fb db030_u
```

```
merge m:1 db010_u db030_u rb030_u using D:\...\Long\IT\PartFM.dta
/*We drop children who have not been associated with any father. */
drop if _merge==1
/*We rename the variable obtained after the merge in order to subsequently distinguish the
children associated with a single parent or both. */
rename _merge m_b_f
/*We sort the dataset so that the children are listed by date of birth. */
sort db030_u rb030_u rb080_u db010_u rb080_fb
/*We count the children per woman sorted by date of birth. */
by db030_u rb030_u rb080_u db010_u: gen sub=_n
/*We put all the children in the same row */
reshape wide *_fb, i(db010_u db030_u rb030_u) j(sub)
/*We generate a variable that indicates the couples in which we only have the children of one of
the two partners*/
gen fi=0
replace fi=1 if m_m_f==3 & m_b_f==2
replace fi=1 if m_m_f==2 & m_b_f==3
save "D:\...\Long\IT\ITfinale.dta", replace
clear
/* We combine the datasets of all available countries for all available years. */
use "D:\...\ATfinale.dta", clear
append using "D:\...\BEfinale.dta"
append using "D:\...\BGfinale.dta"
append using "D:\...\CHfinale.dta"
append using "D:\...\CYfinale.dta"
append using "D:\...\CZfinale.dta"
append using "D:\...\DKfinale.dta"
append using "D:\...\EEfinale.dta"
append using "D:\...\ELfinale.dta"
append using "D:\...\ESfinale.dta"
append using "D:\...\FIfinale.dta"
append using "D:\...\FRfinale.dta"
append using "D:\...\HRfinale.dta"
append using "D:\...\HUfinale.dta"
append using "D:\...\IEfinale.dta"
append using "D:\...\ISfinale.dta"
append using "D:\...\ITfinale.dta"
append using "D:\...\LTfinale.dta"
append using "D:\...\LUfinale.dta"
append using "D:\...\LVfinale.dta"
append using "D:\...\MTfinale.dta"
append using "D:\...\NLfinale.dta"
append using "D:\...\NOfinale.dta"
append using "D:\...\PLfinale.dta"
append using "D:\...\PTfinale.dta"
append using "D:\...\ROfinale.dta"
append using "D:\...\RSfinale.dta"
append using "D:\...\SEfinale.dta"
append using "D:\...\SIfinale.dta"
append using "D:\...\SKfinale.dta"
```

```
append using "D:\...\UKfinale.dta"
/*We check that the years of those who are in pairs are reasonably adequate. We drop all those
who are in pairs but are under 14. */
drop if eta_d<=14
drop if eta_u<=14
/*We make uniform the variable level of education (pe040) so that it assumes the same values for
all countries and for all years. */
gen pe040N_d=pe040_d
gen pe040N_u=pe040_u
replace pe040N_d=1 if pe040N_d==100 & pe040_d!=.
replace pe040N_d=2 if pe040N_d==200 & pe040_d!=.
replace pe040N_d=3 if pe040N_d>=300 & pe040N_d<=354 & pe040_d!=.
replace pe040N_d=4 if pe040N_d>=400 & pe040N_d<=450 & pe040_d!=.
replace pe040N_d=5 if pe040N_d==500 & pe040_d!=.
replace pe040N_d=6 if pe040N_d==600 & pe040_d!=.
replace pe040N_d=7 if pe040N_d==700 & pe040_d!=.
replace pe040N_d=8 if pe040N_d==800 & pe040_d!=.
replace pe040N_u=1 if pe040N_u==100 & pe040_u!=.
replace pe040N_u=2 if pe040N_u==200 & pe040_u!=.
replace pe040N_u=3 if pe040N_u>=300 & pe040N_u<=354 & pe040_u!=.
replace pe040N_u=4 if pe040N_u>=400 & pe040N_u<=450 & pe040_u!=.
replace pe040N_u=5 if pe040N_u==500 & pe040_u!=.
replace pe040N_u=6 if pe040N_u==600 & pe040_u!=.
replace pe040N_u=7 if pe040N_u==700 & pe040_u!=.
replace pe040N_u=8 if pe040N_u==800 & pe040_u!=.
/* We arrange couples in which (for the years under observation) the number of children is not
the same. In particular, we correct cases in which a child born in a given year results only later. */
forvalues i=13(-1)1{
forvalues j=1(1)7{
gen cont_d=0
gen cont_u=0
replace cont_d=1 if rb030_fm`i'[_n]==. & rb030_fm`i'[_n+1]!=. &
rb080_fm`i'[_n+1]<=db010_u[_n] ///
& rb030_d[_n]==rb030_d[_n+1] & db020[_n]==db020[_n+1]
replace cont_u=1 if rb030_fb`i'[_n]==. & rb030_fb`i'[_n+1]!=. &
rb080_fb`i'[_n+1]<=db010_u[_n] ///
& rb030_d[_n]==rb030_d[_n+1] & db020[_n]==db020[_n+1]
foreach var of varlist rb030_fm1-rb230_fm`i'{
replace `var'=`var'[_n+1] if cont_d[_n]==1 & rb030_d[_n]==rb030_d[_n+1] ///
& db020[_n]==db020[_n+1]
}
foreach var of varlist rb030_fb1-rb230_fb`i'{
replace `var'=`var'[_n+1] if cont_u[_n]==1 & rb030_d[_n]==rb030_d[_n+1] ///
& db020[_n]==db020[_n+1]
}
drop cont_d cont_u
}}
/*We correct the cases in which a child present in a given year disappears in the following years.
*/
forvalues i=13(-1)1{
```

```
forvalues j=1(1)9{
gen cont_d=0
gen cont_u=0
replace cont_d=1 if rb030_fm`i'[_n]==. & rb030_fm`i'[_n-1]!=. & rb030_d[_n]==rb030_d[_n-1]
///
& db020[_n]==db020[_n-1]
replace cont_u=1 if rb030_fb`i'[_n]==. & rb030_fb`i'[_n-1]!=. & rb030_d[_n]==rb030_d[_n-1]
///
& db020[_n]==db020[_n-1]
foreach var of varlist rb030_fm1-rb230_fm`i'{
replace `var'=`var'[_n-1] if cont_d[_n]==1 & rb030_d[_n]==rb030_d[_n-1] & ///
db020[_n]==db020[_n-1]
}f
oreach var of varlist rb030_fb1-rb230_fb`i'{
replace `var'=`var'[_n-1] if cont_u[_n]==1 & rb030_d[_n]==rb030_d[_n-1] & ///
db020[_n]==db020[_n-1]
}d
rop cont_d cont_u
}}
//*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/**/*/*/*/*/*/*/*//*/**/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/
/*We check that there are no leaps of years between one observation and another. If there are
leaps of years, we delete the records prior to the jump. */
gen con2=0
gen con3=0
replace con2=1 if db010_u[_n-1]!=db010_u[_n]-1 & rb030_d[_n]==rb030_d[_n-1] & ///
db020[_n]==db020[_n-1]
replace con3=1 if db010_u[_n]==db010_u[_n+1]-1 & con2[_n]==1 & ///
rb030_d[_n]==rb030_d[_n+1] & db020[_n]==db020[_n+1]
drop if con2==1 & con3==0
drop con2 con3
forvalues i=1(1)6{
gen con2=0
replace con2=1 if db010_u[_n]!=db010_u[_n+1]-1 & rb030_d[_n]==rb030_d[_n+1] & ///
db020[_n]==db020[_n+1]
drop if con2==1
drop con2
}
/*We generate a variable that identifies couples who have no children. */
gen figlio0=0
replace figlio0=1 if rb030_fm1==. & rb030_fb1==.
/*We generate a variable that identifies all couples who had their first child during the analysis
period. */
gen neo1_1=0
replace neo1_1=1 if figlio0[_n-1]==1 & figlio0[_n]==0 & rb030_d[_n]==rb030_d[_n-1] ///
& db020[_n]==db020[_n-1]
/* We drop all couples who already had their first child upon entering the dataset. We also drop
couples in the years following the birth of the first event. */
drop if figlio0==0 & neo1_1==0
/* We drop the couples under observation for a single record. */
gen con=0
```

```
replace con=1 if rb030_d[_n]!=rb030_d[_n-1] & rb030_d[_n]!=rb030_d[_n+1]
drop if con==1
drop con
/* We correct the equivalent numerosity variable of the family (hx050) if it is not consistent with
the number of members. */
gen neo_gem=0
replace neo_gem=1 if neo1_1==1 & rb030_fm1!=. & rb030_fm2==.
replace neo_gem=2 if neo1_1==1 & rb030_fm1!=. & rb030_fm2!=. & rb030_fm3==.
replace neo_gem=3 if neo1_1==1 & rb030_fm1!=. & rb030_fm2!=. & rb030_fm3!=.
replace hx050=1.5 if hx050==1
replace hx050=1.5 if hx050==1.3
replace hx050=1.8 if hx050==1.5 & neo_gem==1
replace hx050=2.1 if hx050==1.5 & neo_gem==2
replace hx050=2.4 if hx050==1.5 & neo_gem==3
replace hx050=1.5 if hx050==1.6
replace hx050=1.8 if hx050==1.9
replace hx050=2.3 if hx050==2 & neo_gem==1
replace hx050=2.6 if hx050==2 & neo_gem==2
/* We drop 2016 and some countries. */
drop if db010==2016
drop if db020=="RO" | db020=="MT" | db020=="IE" | db020=="ES" | db020=="CY" |
db020=="LU"
/* We make uniform the marital status variable (pb200). */
gen pb200N_d=pb200_d
replace pb200N_d=1 if pb200_d==3 & pb200_u==1
replace pb200N_d=1 if pb200_d==. & pb200_u==1
replace pb200N_d=2 if pb200_d==3 & pb200_u==2
replace pb200N_d=2 if pb200_d==. & pb200_u==2
drop if pb200N_d==3
gen ordine=_n
*********************************************************************************
/*We define the covariates used in the models*/
//calendar year
gen time=0
local i=1
forvalues j=2003(1)2015{
replace time=`i' if db010==`j'
local i=`i'+1
}g
en time08=time-6
label def tim -5 "2003" -4 "2004" -3 "2005" -2 "2006" -1 "2007" 0 "2008" 1 "2009" 2 "2010" 3
"2011" 4 "2012" 5 "2013" 6 "2014" 7 "2015"
label values time08 tim
//a.1) HIGHEST ISCED LEVEL ATTAINED WOMEN
gen istr_d=pe040N_d
replace istr_d=5 if pe040N_d>=6 & pe040N_d!=.
gen istrN_d=istr_d[_n-1] if rb030_d[_n]==rb030_d[_n-1]
replace istrN_d=100 if istr_d[_n-1]==. & rb030_d[_n]==rb030_d[_n-1]
gen edu_d=1
replace edu_d=2 if istrN_d==3 | istrN_d==4
```

```
replace edu_d=3 if istrN_d==5
replace edu_d=0 if istrN_d==100
label def e 0 "missing" 1 "low" 2 "medium" 3 "high"
label values edu_d e
//a.2) HIGHEST ISCED LEVEL ATTAINED MEN
gen istr_u=pe040N_u
replace istr_u=5 if pe040N_u>=6 & pe040N_u!=.
gen istrN_u=istr_u[_n-1] if rb030_u[_n]==rb030_u[_n-1]
replace istrN_u=100 if istr_u[_n-1]==. & rb030_d[_n]==rb030_d[_n-1]
gen edu_u=1
replace edu_u=2 if istrN_u==3 | istrN_u==4
replace edu_u=3 if istrN_u==5
replace edu_u=0 if istrN_u==100
label values edu_u e
//b.1) MAIN ACTIVITY STATUS AND WORK CHARACTERISTICS WOMEN
//employee
gen emp_d=1 if pl030_d==1 & pl040_d==3 & pl031_d==.
replace emp_d=1 if pl030_d==2 & pl040_d==3 & pl031_d==.
replace emp_d=1 if pl031_d==1
replace emp_d=1 if pl031_d==2
//self-employed
replace emp_d=2 if pl030_d==1 & pl040_d!=3 & pl031_d==.
replace emp_d=2 if pl030_d==2 & pl040_d!=3 & pl031_d==.
replace emp_d=2 if pl031_d==3
replace emp_d=2 if pl031_d==4
//unemployed
replace emp_d=3 if pl030_d==3 & pl031_d==.
replace emp_d=3 if pl031_d==5
//not active
replace emp_d=4 if pl030_d==8 & pl031_d==.
replace emp_d=4 if pl030_d==9 & pl031_d==.
replace emp_d=4 if pl031_d==10
replace emp_d=4 if pl031_d==11
//other
replace emp_d=5 if pl030_d==4 & pl031_d==.
replace emp_d=5 if pl030_d==5 & pl031_d==.
replace emp_d=5 if pl030_d==6 & pl031_d==.
replace emp_d=5 if pl030_d==7 & pl031_d==.
replace emp_d=5 if pl031_d==6
replace emp_d=5 if pl031_d==7
replace emp_d=5 if pl031_d==8
replace emp_d=5 if pl031_d==9
//permanent employee
gen act_d=1 if emp_d==1 & pl140_d==1
//temporary employee
replace act_d=2 if emp_d==1 & pl140_d==2
//self-employed, unemployed, not active and other
replace act_d=3 if emp_d==2
replace act_d=4 if emp_d==3
replace act_d=5 if emp_d==4
```

```
replace act_d=6 if emp_d==5
//missing
replace act_d=0 if act_d==.
gen actst_d=act_d[_n-1] if rb030_d[_n]==rb030_d[_n-1]
label def s 0 "missing" 1 "Work Perm" 2 "Work Temp" 3 "Self-Employed" 4 "Unemployed" 5
"Not
Active" 6 "Other"
label values actst_d s
//b.2) MAIN ACTIVITY STATUS AND WORK CHARACTERISTICS MEN
//employee
gen emp_u=1 if pl030_u==1 & pl040_u==3 & pl031_u==.
replace emp_u=1 if pl030_u==2 & pl040_u==3 & pl031_u==.
replace emp_u=1 if pl031_u==1
replace emp_u=1 if pl031_u==2
//self-employed
replace emp_u=2 if pl030_u==1 & pl040_u!=3 & pl031_u==.
replace emp_u=2 if pl030_u==2 & pl040_u!=3 & pl031_u==.
replace emp_u=2 if pl031_u==3
replace emp_u=2 if pl031_u==4
//unemployed
replace emp_u=3 if pl030_u==3 & pl031_u==.
replace emp_u=3 if pl031_u==5
//not active
replace emp_u=4 if pl030_u==8 & pl031_u==.
replace emp_u=4 if pl030_u==9 & pl031_u==.
replace emp_u=4 if pl031_u==10
replace emp_u=4 if pl031_u==11
//other
replace emp_u=5 if pl030_u==4 & pl031_u==.
replace emp_u=5 if pl030_u==5 & pl031_u==.
replace emp_u=5 if pl030_u==6 & pl031_u==.
replace emp_u=5 if pl030_u==7 & pl031_u==.
replace emp_u=5 if pl031_u==6
replace emp_u=5 if pl031_u==7
replace emp_u=5 if pl031_u==8
replace emp_u=5 if pl031_u==9
//permanent employee
gen act_u=1 if emp_u==1 & pl140_u==1
//temporary employee
replace act_u=2 if emp_u==1 & pl140_u==2
//self-employed, unemployed, not active, other
replace act_u=3 if emp_u==2
replace act_u=4 if emp_u==3
replace act_u=5 if emp_u==4
replace act_u=6 if emp_u==5
//missing
replace act_u=0 if act_u==.
gen actst_u=act_u[_n-1] if rb030_d[_n]==rb030_d[_n-1]
label values actst_u s
//c) PARTNERSHIP STATUS
```

```
gen union=pb200N_d[_n-1] if rb030_d[_n]==rb030_d[_n-1]
replace union=0 if pb200N_d[_n-1]==. & rb030_d[_n]==rb030_d[_n-1]
label def u 0 "missing" 1 "Married" 2 "Cohabitation"
label values union u
//d) INCOME TERCILE
/*We use the variable hx050 which indicates the equivalent size of the family (even if someone else lives together with the couple and children) to calculate the equivalent income and then the terciles of income. */
/* Since the variable income exists both gross and net and both values are not always available, we use where possible the gross (py010g) and in the remaining cases the net (py010n). */
gen py010nN_d=py010n_d
replace py010nN_d=. if py010n_d==0 & actst_d<=3
gen py010nN_u=py010n_u
replace py010nN_u=. if py010n_u==0 & actst_u<=3
gen py010gN_d=py010g_d
replace py010gN_d=. if py010g_d==0 & actst_d<=3
gen py010gN_u=py010g_u
replace py010gN_u=. if py010g_u==0 & actst_u<=3
gen ind_d=1
replace ind_d=2 if py010nN_d!=. & py010gN_d==.
replace ind_d=0 if py010nN_d==. & py010gN_d==.
gen ind_u=1
replace ind_u=2 if py010nN_u!=. & py010gN_u==.
replace ind_u=0 if py010nN_u==. & py010gN_u==.
gen neqinc_d=py010nN_d/hx050N if ind_d==2
gen geqinc_d=py010gN_d/hx050N if ind_d==1
gen neqinc_u=py010nN_u/hx050N if ind_u==2
gen geqinc_u=py010gN_u/hx050N if ind_u==1
/*We generate the equivalent income terciles.*/
egen country=group(db020)
egen gterc_d=xtile(geqinc_d) if geqinc_d!=., n(3) by(country)
egen nterc_d=xtile(neqinc_d) if neqinc_d!=., n(3) by(country)
gen tercile_d=gterc_d
replace tercile_d=nterc_d if tercile_d==.
replace tercile_d=0 if tercile_d==.
egen gterc_u=xtile(geqinc_u) if geqinc_u!=., n(3) by(country)
egen nterc_u=xtile(neqinc_u) if neqinc_u!=., n(3) by(country)
gen tercile_u=gterc_u
replace tercile_u=nterc_u if tercile_u==.
replace tercile_u=0 if tercile_u==.
gen tercileN_d=tercile_d[_n-1] if rb030_d[_n]==rb030_d[_n-1]
gen tercileN_u=tercile_u[_n-1] if rb030_d[_n]==rb030_d[_n-1]
label def t 0 "missing" 1 "Low" 2 "Medium" 3 "High"
label values tercileN_d t
label values tercileN_u t
//e) MACRO-AREA OF RESIDENCE
gen wel=4
replace wel=1 if db020=="DK" | db020=="FI" | db020=="NO" | db020=="SE" | db020=="IS"
replace wel=2 if db020=="AT" | db020=="BE" | db020=="FR" | db020=="NL" ///
| db020=="UK" | db020=="CH"
```

```
replace wel=3 if db020=="EL" | db020=="IT" | db020=="PT" | db020=="GR"
label def wel 1 "Nordic" 2 "Western" 3 "Southern" 4 "Eastern"
label values wel wel
/*We drop the first records of each pair for which it is not possible to have information relating to
the previous year. */
gen etaL_d=eta_d-1
gen etaL_u=eta_u-1
drop if istrN_d==.
//f) AGE AT THE FIRST WAVE
gen anniw1_d=etaL_d
gen anniw1_u=etaL_u
replace anniw1_d=anniw1_d[_n-1] if rb030_d[_n]==rb030_d[_n-1]
replace anniw1_u=anniw1_u[_n-1] if rb030_d[_n]==rb030_d[_n-1]
gen age_d=1 if anniw1_d<25
replace age_d=2 if anniw1_d>=25 & anniw1_d<30
replace age_d=3 if anniw1_d>=30 & anniw1_d<35
replace age_d=4 if anniw1_d>=35 & anniw1_d<40
replace age_d=5 if anniw1_d>=40
label def age 1 "15-25" 2 "25-30" 3 "30-35" 4 "35-40" 5 "40+"
label values age_d age
gen age_u=1 if anniw1_u<25
replace age_u=2 if anniw1_u>=25 & anniw1_u<30
replace age_u=3 if anniw1_u>=30 & anniw1_u<35
replace age_u=4 if anniw1_u>=35 & anniw1_u<40
replace age_u=5 if anniw1_u>=40
label values age_u age
//g) DUMMY YEAR
forval i=6/9{
gen d0`i'=1
replace d0`i'=0 if db010<200`i'
}
forval i=10/13{
gen d`i'=1
replace d`i'=0 if db010<20`i'
}
/* We generate a variable that counts the records of each pair.  */
by db020 rb030_d: gen wave2 = _n
/* We generate a particular variable from the record count of each pair that has categories: 1, 2, 3,
4+. */
gen wave3=wave2
replace wave3=4 if wave2>4
save "D:\...\FINAL1F.dta", replace
//*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/*/
/*MODELS*/
/* We generate a variable to divide the dataset into a control and validation group for the analysis
of the goodness-of-fit. */
set seed 1
gen val=runiform()<0.1
replace val=val[_n-1] if rb030_d[_n]==rb030_d[_n-1] & db020[_n]==db020[_n-1]
//1) First Model
```

```
meqrlogit neo1_1 ibn.wave3 i.d08 ib2.age_d ib2.age_u ib1.union ib1.edu_d ib1.edu_u ///
ib1.actst_d ib1.actst_u c.time08##c.time08, nocons ||country: time08, ///
intpoints(3) cov(un)
estimates store m_rslope5
margins, dydx(_all) predict(mu fixedonly) post
estimates store m1
estat ic
*********************************************************************************
//Graph for AME coefficients
coefplot m1, xline(0) xtitle(Average Marginal Effect) scale(0.6) aspectratio(1.1) ///
drop(0.union 0.edu_d 0.edu_u 0.actst_d 0.actst_u time08) ///
headings(2.wave3 = "{bf:Wave}" ///
1.d08 = "{bf:Post-2008}" ///
1.age_d = "{bf:Women's Age}" ///
1.age_u = "{bf:Men's Age}" ///
2.union = "{bf:Partnership Status}" ///
2.edu_d = "{bf:Women's Education}" ///
2.edu_u = "{bf:Men's Educ ation}" ///
2.actst_d = "{bf:Women's Activity Status}" ///
2.actst_u = "{bf:Men's Activity Status}")
graph export "D:\...\Coefplot m_rslope5.png", as(png) replace
*********************************************************************************
//2) Second Model
meqrlogit neo1_1 ibn.wave3 i.d08 ib2.age_d ib2.age_u ib1.union ib1.edu_d ib1.edu_u ///
ib1.actst_d ib1.actst_u ib1.tercileN_d ib1.tercileN_u c.time08##c.time08, ///
nocons ||country: time08, intpoints(3) cov(un)
estimates store m_rslope6
margins, dydx(_all) predict(mu fixedonly) post
estimates store m2
estat ic
*********************************************************************************
//Graph for the AME coefficients
coefplot m2, xline(0) xtitle(Average Marginal Effect) scale(0.6) aspectratio(1.1) ///
drop(0.union 0.edu_d 0.edu_u 0.actst_d 0.actst_u 0.tercileN_d 0.tercileN_u time08) ///
headings(2.wave3 = "{bf:Wave}" ///
1.d08 = "{bf:Post-2008}" ///
1.age_d = "{bf:Women's Age}" ///
1.age_u = "{bf:Men's Age}" ///
2.union = "{bf:Partnership Status}" ///
2.edu_d = "{bf:Women's Education}" ///
2.edu_u = "{bf:Men's Educ ation}" ///
2.actst_d = "{bf:Women's Activity Status}" ///
2.actst_u = "{bf:Men's Activity Status}" ///
2.tercileN_d = "{bf:Women's Income Tercile}" ///
2.tercileN_u = "{bf:Men's Income Tercile}")
graph export "D:\...\Coefplot m_rslope6.png", as(png) replace
*********************************************************************************
//3) Third Model
meqrlogit neo1_1 ibn.wave3 i.d08 ib2.age_d ib2.age_u ib1.union ib1.edu_d ib1.edu_u ///
ib1.actst_d##ib1.actst_u ib1.tercileN_d ib1.tercileN_u c.time08##c.time08, ///
```

```
nocons ||country: time08, intpoints(5) cov(un)
estimates store m_rslope7
margins, dydx(_all) predict(mu fixedonly) post
estimates store m3
estat ic
*******************************************************************************
//Graph of the AME coefficients
coefplot m3, xline(0) xtitle(Average Marginal Effect) scale(0.6) aspectratio(1.1) ///
drop(0.union 0.edu_d 0.edu_u 0.actst_d 0.actst_u 0.tercileN_d 0.tercileN_u time08) ///
headings(2.wave3 = "{bf:Wave}" ///
1.d08 = "{bf:Post-2008}" ///
1.age_d = "{bf:Women's Age}" ///
1.age_u = "{bf:Men's Age}" ///
2.union = "{bf:Partnership Status}" ///
2.edu_d = "{bf:Women's Education}" ///
2.edu_u = "{bf:Men's Educ ation}" ///
2.actst_d = "{bf:Women's Activity Status}" ///
2.actst_u = "{bf:Men's Activity Status}" ///
2.tercileN_d = "{bf:Women's Income Tercile}" ///
2.tercileN_u = "{bf:Men's Income Tercile}")
graph export "D:\...\Coefplot m_rslope7.png", as(png) replace
*******************************************************************************
//4) Fourth Model
meqrlogit neo1_1 ibn.wave3 i.d08 ib2.age_d ib2.age_u ib1.union ib1.edu_d ib1.edu_u ///
ib1.actst_d##ib1.actst_u ib1.tercileN_d ib1.tercileN_u c.time08##c.time08 ///
ib1.wel##actst_d ib1.wel##actst_u, nocons ||country: time08, ///
intpoints(5) cov(un)
estimates store m_rslope11
margins, dydx(_all) predict(mu fixedonly) post
estimates store m4
estat ic
predict v1 v0, reffects reses(sev1 sev0)
egen pickone=tag(country)
l db020 v1 v0 if pickone==1
drop v1 v0 sev1 sev0
*******************************************************************************
//Graphs of the AME coefficients
coefplot m4, xline(0) xtitle(Average Marginal Effect) scale(0.6) aspectratio(1.1) ///
drop(0.union 0.edu_d 0.edu_u 0.actst_d 0.actst_u 0.tercileN_d 0.tercileN_u time08) ///
headings(2.wave3 = "{bf:Wave}" ///
1.d08 = "{bf:Post-2008}" ///
1.age_d = "{bf:Women's Age}" ///
1.age_u = "{bf:Men's Age}" ///
2.union = "{bf:Partnership Status}" ///
2.edu_d = "{bf:Women's Education}" ///
2.edu_u = "{bf:Men's Educ ation}" ///
2.actst_d = "{bf:Women's Activity Status}" ///
2.actst_u = "{bf:Men's Activity Status}" ///
2.tercileN_d = "{bf:Women's Income Tercile}" ///
2.tercileN_u = "{bf:Men's Income Tercile}" ///
```

```
2.wel = "{bf:Europe Area}")
graph export "D:\...\Coefplot m_rslope11.png", as(png) replace
coefplot m1 m2 m3 m4, xline(0) xtitle(Average Marginal Effect) scale(0.6) aspectratio(1.1) ///
xscale(range(-0.15(0.05)0.05)) keep(2.actst_d 3.actst_d 4.actst_d 5.actst_d 6.actst_d 2.actst_u
3.actst_u ///
4.actst_u 5.actst_u 6.actst_u 2.tercileN_d 3.tercileN_d 2.tercileN_u 3.tercileN_u) ///
headings(2.actst_d = "{bf:Women's Activity Status}" ///
2.actst_u = "{bf:Men's Activity Status}" ///
2.tercileN_d = "{bf:Women's Income Tercile}" ///
2.tercileN_u = "{bf:Men's Income Tercile}")
graph export "D:\...\Coefplot m1_m2_m3.png", as(png) replace
*******************************************************************************
/*GOODENSS-OF-FIT*/
//Goodness-of-fit (First Model)
qui meqrlogit neo1_1 ibn.wave3 i.d08 ib2.age_d ib2.age_u ib1.union ib1.edu_d ib1.edu_u ///
ib1.actst_d ib1.actst_u c.time08##c.time08 if val==0, nocons ||country: time08, ///
intpoints(3) cov(un)
predict p1
hl neo1_1 p1 if val==1 //Hosmer and Lemshow test
pmcalplot p1 neo1_1 if val==1, nolowess nospike
graph export "D:\...\Calibration Plot m_rslope5.png", as(png) replace
/* We reproduce the values obtained in the calibration plot to perform the equality tests at 1 of the
calibration slope and at 0 of the calibration-in-the-large. */
qui gen bin_lp1=ln(p1/(1-p1))
logistic neo1_1 bin_lp1 if val==1, coef
test _b[bin_lp1]==1
logistic neo1_1 if val==1, offset(bin_lp1) coef
test _b[_cons]==0
//Goodness-of-fit (Second Model)
qui meqrlogit neo1_1 ibn.wave3 i.d08 ib2.age_d ib2.age_u ib1.union ib1.edu_d ib1.edu_u ///
ib1.actst_d ib1.actst_u ib1.tercileN_d ib1.tercileN_u c.time08##c.time08 if val==0, ///
nocons ||country: time08, intpoints(3) cov(un)
predict p2
hl neo1_1 p2 if val==1 //Hosmer and Lemshow test
pmcalplot p2 neo1_1 if val==1, nolowess nospike
graph export "D:\...\Calibration Plot m_rslope6.png", as(png) replace
/* We reproduce the values obtained in the calibration plot to perform the equality tests at 1 of the
calibration slope and at 0 of the calibration-in-the-large. */
qui gen bin_lp2=ln(p2/(1-p2))
logistic neo1_1 bin_lp2 if val==1, coef
test _b[bin_lp2]==1
logistic neo1_1 if val==1, offset(bin_lp2) coef
test _b[_cons]==0
//Goodness-of-fit (Third Model)
qui meqrlogit neo1_1 ibn.wave3 i.d08 ib2.age_d ib2.age_u ib1.union ib1.edu_d ib1.edu_u ///
ib1.actst_d##ib1.actst_u ib1.tercileN_d ib1.tercileN_u c.time08##c.time08 if val==0, ///
nocons ||country: time08, intpoints(5) cov(un)
predict p3
hl neo1_1 p3 if val==1 //Hosmer and Lemshow test
pmcalplot p3 neo1_1 if val==1, nolowess nospike
```

```
graph export "D:\...\Calibration Plot m_rslope7.png", as(png) replace
/* We reproduce the values obtained in the calibration plot to perform the equality tests at 1 of the
calibration slope and at 0 of the calibration-in-the-large. */
qui gen bin_lp3=ln(p3/(1-p3))
logistic neo1_1 bin_lp3 if val==1, coef
test _b[bin_lp3]==1
logistic neo1_1 if val==1, offset(bin_lp3) coef
test _b[_cons]==0
//Goodness-of-fit (Fourth Model)
qui meqrlogit neo1_1 ibn.wave3 i.d08 ib2.age_d ib2.age_u ib1.union ib1.edu_d ib1.edu_u ///
ib1.actst_d##ib1.actst_u ib1.tercileN_u ib1.tercileN_d c.time08##c.time08 ///
ib1.wel##actst_d ib1.wel##actst_u if val==0, nocons ||country: time08, ///
intpoints(5) cov(un)
predict p4
hl neo1_1 p4 if val==1 //Hosmer and Lemshow test
pmcalplot p4 neo1_1 if val==1, nolowess nospike
graph export "D:\...\Calibration Plot m_rslope11.png", as(png) replace
/*We reproduce the values obtained in the calibration plot to perform the equality tests at 1 of the
calibration slope and at 0 of the calibration-in-the-large. */
qui gen bin_lp4=ln(p4/(1-p4))
logistic neo1_1 bin_lp4 if val==1, coef
test _b[bin_lp4]==1
logistic neo1_1 if val==1, offset(bin_lp4) coef
test _b[_cons]==0
**********************************************************************************
/*STRUCTURAL BREAKS*/
//WEL==1 (Northern)
forval i=6/9{
qui logit neo1_1 ibn.wave3 ibn.country i.d0`i' ib2.age_d ib2.age_u ib1.union ///
ib1.edu_d ib1.edu_u ib1.actst_d ib1.actst_u ib1.tercileN_d ib1.tercileN_u ///
c.time08##c.time08 if wel==1, nocons
estimates store n0`i'
test _b[1.d0`i']=0
di _b[1.d0`i']
margins, dydx(d0`i')
qui logit neo1_1 ibn.wave3 i.d0`i'##(ibn.country ib2.age_d ib2.age_u ib1.union ///
ib1.edu_d ib1.edu_u ib1.actst_d ib1.actst_u ib1.tercileN_d ib1.tercileN_u ///
c.time08##c.time08) if wel==1, nocons
estimates store n1`i'
lrtest n0`i' n1`i', force
}
forval i=10/15{
qui logit neo1_1 ibn.wave3 ibn.country i.d`i' ib2.age_d ib2.age_u ib1.union ///
ib1.edu_d ib1.edu_u ib1.actst_d ib1.actst_u ib1.tercileN_d ib1.tercileN_u ///
c.time08##c.time08 if wel==1, nocons
estimates store n0`i'
test _b[1.d`i']=0
di _b[1.d`i']
margins, dydx(d`i')
qui logit neo1_1 ibn.wave3 i.d`i'##(ibn.country ib2.age_d ib2.age_u ib1.union ///
```

```
ib1.edu_d ib1.edu_u ib1.actst_d ib1.actst_u ib1.tercileN_d ib1.tercileN_u ///
c.time08##c.time08) if wel==1, nocons
estimates store n1`i'
lrtest n0`i' n1`i', force
}
//WEL==2 (Western)
forval i=6/9{
qui logit neo1_1 ibn.wave3 ibn.country i.d0`i' ib2.age_d ib2.age_u ib1.union ///
ib1.edu_d ib1.edu_u ib1.actst_d ib1.actst_u ib1.tercileN_d ib1.tercileN_u ///
c.time08##c.time08 if wel==2, nocons
estimates store w0`i'
test _b[1.d0`i']=0
di _b[1.d0`i']
margins, dydx(d0`i')
qui logit neo2_1 ibn.wave3 i.d0`i'##(ibn.country ib2.age_d ib2.age_u ib1.union ///
ib1.edu_d ib1.edu_u ib1.actst_d ib1.actst_u ib1.tercileN_d ib1.tercileN_u ///
c.time08##c.time08) if wel==2, nocons
estimates store w1`i'
lrtest w0`i' w1`i', force
}
forval i=10/15{
qui logit neo1_1 ibn.wave3 ibn.country i.d`i' ib2.age_d ib2.age_u ib1.union ///
ib1.edu_d ib1.edu_u ib1.actst_d ib1.actst_u ib1.tercileN_d ib1.tercileN_u ///
c.time08##c.time08 if wel==2, nocons
estimates store w0`i'
test _b[1.d`i']=0
di _b[1.d`i']
margins, dydx(d`i')
qui logit neo1_1 ibn.wave3 i.d`i'##(ibn.country ib2.age_d ib2.age_u ib1.union ///
ib1.edu_d ib1.edu_u ib1.actst_d ib1.actst_u ib1.tercileN_d ib1.tercileN_u ///
c.time08##c.time08) if wel==2, nocons
estimates store w1`i'
lrtest w0`i' w1`i', force
}
//WEL==3 (Southern)
forval i=6/9{
qui logit neo1_1 ibn.wave3 ibn.country i.d0`i' ib2.age_d ib2.age_u ib1.union ///
ib1.edu_d ib1.edu_u ib1.actst_d ib1.actst_u ib1.tercileN_d ib1.tercileN_u ///
c.time08##c.time08 if wel==3, nocons
estimates store s0`i'
test _b[1.d0`i']=0
di _b[1.d0`i']
margins, dydx(d0`i')
qui logit neo1_1 ibn.wave3 i.d0`i'##(ibn.country ib2.age_d ib2.age_u ib1.union ///
ib1.edu_d ib1.edu_u ib1.actst_d ib1.actst_u ib1.tercileN_d ib1.tercileN_u ///
c.time08##c.time08) if wel==3, nocons
estimates store s1`i'
lrtest s0`i' s1`i', force
}
forval i=10/15{
```

```
qui logit neo1_1 ibn.wave3 ibn.country i.d`i' ib2.age_d ib2.age_u ib1.union ///
ib1.edu_d ib1.edu_u ib1.actst_d ib1.actst_u ib1.tercileN_d ib1.tercileN_u ///
c.time08##c.time08 if wel==3, nocons
estimates store s0`i'
test _b[1.d`i']=0
di _b[1.d`i']
margins, dydx(d`i')
qui logit neo1_1 ibn.wave3 i.d`i'##(ibn.country ib2.age_d ib2.age_u ib1.union ///
ib1.edu_d ib1.edu_u ib1.actst_d ib1.actst_u ib1.tercileN_d ib1.tercileN_u ///
c.time08##c.time08) if wel==3, nocons
estimates store s1`i'
lrtest s0`i' s1`i', force
}
//WEL==4 (Eastern)
forval i=6/9{
qui logit neo1_1 ibn.wave3 ibn.country i.d0`i' ib2.age_d ib2.age_u ib1.union ///
ib1.edu_d ib1.edu_u ib1.actst_d ib1.actst_u ib1.tercileN_d ib1.tercileN_u ///
c.time08##c.time08 if wel==4, nocons
estimates store e0`i'
test _b[1.d0`i']=0
di _b[1.d0`i']
margins, dydx(d0`i')
qui logit neo1_1 ibn.wave3 i.d0`i'##(ibn.country ib2.age_d ib2.age_u ib1.union ///
ib1.edu_d ib1.edu_u ib1.actst_d ib1.actst_u ib1.tercileN_d ib1.tercileN_u ///
c.time08##c.time08) if wel==4, nocons
estimates store e1`i'
lrtest e0`i' e1`i', force
}
forval i=10/15{
qui logit neo1_1 ibn.wave3 ibn.country i.d`i' ib2.age_d ib2.age_u ib1.union ///
ib1.edu_d ib1.edu_u ib1.actst_d ib1.actst_u ib1.tercileN_d ib1.tercileN_u ///
c.time08##c.time08 if wel==4, nocons
estimates store e0`i'
test _b[1.d`i']=0
di _b[1.d`i']
margins, dydx(d`i')
qui logit neo1_1 ibn.wave3 i.d`i'##(ibn.country ib2.age_d ib2.age_u ib1.union ///
ib1.edu_d ib1.edu_u ib1.actst_d ib1.actst_u ib1.tercileN_d ib1.tercileN_u ///
c.time08##c.time08) if wel==4, nocons
estimates store e1`i'
lrtest e0`i' e1`i', force
}
/*Based on the results of the structural breaks analysis, we repeat the first and second models in
2008 for the northern countries, in 2010 for the Western and Southern countries, and in 2009 for
CEE countries. */
/*First Model*/
/*N)*/
logit neo1_1 ibn.country ibn.wave3 i.d08 ib2.age_d ib2.age_u ib1.union ib1.edu_d ib1.edu_u ///
ib1.actst_d ib1.actst_u c.time08##c.time08 if wel==1, nocons
estimates store m_rslope5N
```

```
margins, dydx(_all)
estat ic
/*W)*/
logit neo1_1 ibn.country ibn.wave3 i.d10 ib2.age_d ib2.age_u ib1.union ib1.edu_d ib1.edu_u ///
ib1.actst_d ib1.actst_u c.time08##c.time08 if wel==2, nocons
estimates store m_rslope5W
margins, dydx(_all)
estat ic
/*S)*/
logit neo1_1 ibn.country ibn.wave3 i.d10 ib2.age_d ib2.age_u ib1.union ib1.edu_d ib1.edu_u ///
ib1.actst_d ib1.actst_u c.time08##c.time08 if wel==3, nocons
estimates store m_rslope5S
margins, dydx(_all)
estat ic
/*E)*/
logit neo1_1 ibn.country ibn.wave3 i.d09 ib2.age_d ib2.age_u ib1.union ib1.edu_d ib1.edu_u ///
ib1.actst_d ib1.actst_u c.time08##c.time08 if wel==4, nocons
estimates store m_rslope5E
margins, dydx(_all)
estat ic
/*Second Model*/
/*N)*/
logit neo1_1 ibn.country ibn.wave3 i.d08 ib2.age_d ib2.age_u ib1.union ib1.edu_d ///
ib1.edu_u ib1.actst_d ib1.actst_u ib1.tercileN_d ib1.tercileN_u ///
c.time08##c.time08 if wel==1, nocons
estimates store m_rslope6N
margins, dydx(_all)
estat ic
/*W)*/
logit neo1_1 ibn.country ibn.wave3 i.d10 ib2.age_d ib2.age_u ib1.union ib1.edu_d ///
ib1.edu_u ib1.actst_d ib1.actst_u ib1.tercileN_d ib1.tercileN_u ///
c.time08##c.time08 if wel==2, nocons
estimates store m_rslope6W
margins, dydx(_all)
estat ic
/*S)*/
logit neo1_1 ibn.country ibn.wave3 i.d10 ib2.age_d ib2.age_u ib1.union ib1.edu_d ///
ib1.edu_u ib1.actst_d ib1.actst_u ib1.tercileN_d ib1.tercileN_u ///
c.time08##c.time08 if wel==3, nocons
estimates store m_rslope6S
margins, dydx(_all)
estat ic
/*E)*/
logit neo1_1 ibn.country ibn.wave3 i.d09 ib2.age_d ib2.age_u ib1.union ib1.edu_d ///
ib1.edu_u ib1.actst_d ib1.actst_u ib1.tercileN_d ib1.tercileN_u ///
c.time08##c.time08 if wel==4, nocons
estimates store m_rslope6E
margins, dydx(_all)
estat ic
```

```
/*SAMPLE ATTRITION*/
use "D:\... \PREL.dta", clear
/* First, we arrange couples in which (for the years under observation) the number of children is not the same. In particular, we correct cases in which a child born in a given year results only later. As in the previous case. */
/*Then we correct the cases in which a child present in a given year disappears in the following years. As in the previous case. */
/*We drop all couples who are not at risk of having the first or the second child. */
gen child_d=0
gen child_u=0
replace child_d=1 if rb030_fm2[_n]!=. & rb030_d[_n]!=rb030_d[_n-1]
replace child_d=1 if child_d[_n-1]==1 & rb030_d[_n]==rb030_d[_n-1] & paese[_n]==paese[_n-1]
replace child_u=1 if rb030_fb2[_n]!=. & rb030_d[_n]!=rb030_d[_n-1]
replace child_u=1 if child_u[_n-1]==1 & rb030_d[_n]==rb030_d[_n-1] & paese[_n]==paese[_n-1]
drop if child_d==1
drop if child_u==1
drop child_d child_u
/*We define the covariates used in the models as in the case previous case. */
/* We compute a variable that identifies the number of records for which the couple is being observed. */
by paese rb030_d: egen massimo=max(wave)
/*We generate a variable that checks that the first year of the interview is not close to the end of the observation period (<4 years earlier). Furthermore, we also identify how many the first interview is close to the end of the observation period. */
gen anno1=db010_u
replace anno1=anno1[_n-1] if rb030_d[_n]==rb030_d[_n-1] & paese[_n]==paese[_n-1]
gen cont_anno1=0
replace cont_anno1=3 if anno1==2014
replace cont_anno1=3 if anno1==2013 & paese=="IS"
replace cont_anno1=3 if anno1==2013 & paese=="LT"
replace cont_anno1=3 if anno1==2013 & paese=="UK"
replace cont_anno1=2 if anno1==2015
replace cont_anno1=2 if anno1==2014 & paese=="IS"
replace cont_anno1=2 if anno1==2014 & paese=="LT"
replace cont_anno1=2 if anno1==2014 & paese=="UK"
replace cont_anno1=1 if anno1==2016
replace cont_anno1=1 if anno1==2015 & paese=="IS"
replace cont_anno1=1 if anno1==2015 & paese=="LT"
replace cont_anno1=1 if anno1==2015 & paese=="UK"
/* We generate a variable that identifies women who are close to 50 years. */
>=47*/
gen cont_eta=0
replace cont_eta=3 if anniw1_d==47
replace cont_eta=2 if anniw1_d==48
replace cont_eta=1 if anniw1_d==49
/* We generate the variable attrition which takes value 0 if the couple is under observation for 4+ years or if they leave the dataset by design and 1 in the year in which the couple experiences the drop-out. */
```

```
gen attrito=0
replace attrito=1 if massimo<4 & rb030_d[_n]!=rb030_d[_n+1] & cont_anno1==0 ///
& cont_eta==0
replace attrito=1 if massimo<3 & rb030_d[_n]!=rb030_d[_n+1] & cont_anno1==3 ///
& cont_eta!=2 & cont_eta!=1
replace attrito=1 if massimo<3 & rb030_d[_n]!=rb030_d[_n+1] & cont_eta==3 ///
& cont_anno1!=2 & cont_anno1!=1
replace attrito=1 if massimo==1 & rb030_d[_n]!=rb030_d[_n+1] & cont_anno1==2 ///
& cont_eta!=1
replace attrito=1 if massimo==1 & rb030_d[_n]!=rb030_d[_n+1] & cont_eta==2 ///
& cont_anno1!=1
/* We generate a variable that allows us to identify the number of pairs per country. */
egen coppie=tag(paese rb030_d)
/* We identify the number of couples experiencing dropout by country and wave. */
tab paese coppie if coppie==1
tab paese attrito if attrito==1 & massimo==1
tab paese attrito if attrito==1 & massimo==2
tab paese attrito if attrito==1 & massimo==3
/* Model for the attrition. */
logit attrito ibn.country ib2.age_d ib2.age_u ib1.union ib1.edu_d ib1.edu_u ///
ib1.act_d ib1.act_u ib1.tercile_d ib1.tercile_u, nocons or
estimate store att
estat ic
margins, dydx(_all) post
estimate store marg_att
```

Notes: The part of the script for the other countries (different from Italy), and the part of the script relative to the second child are available upon request.

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